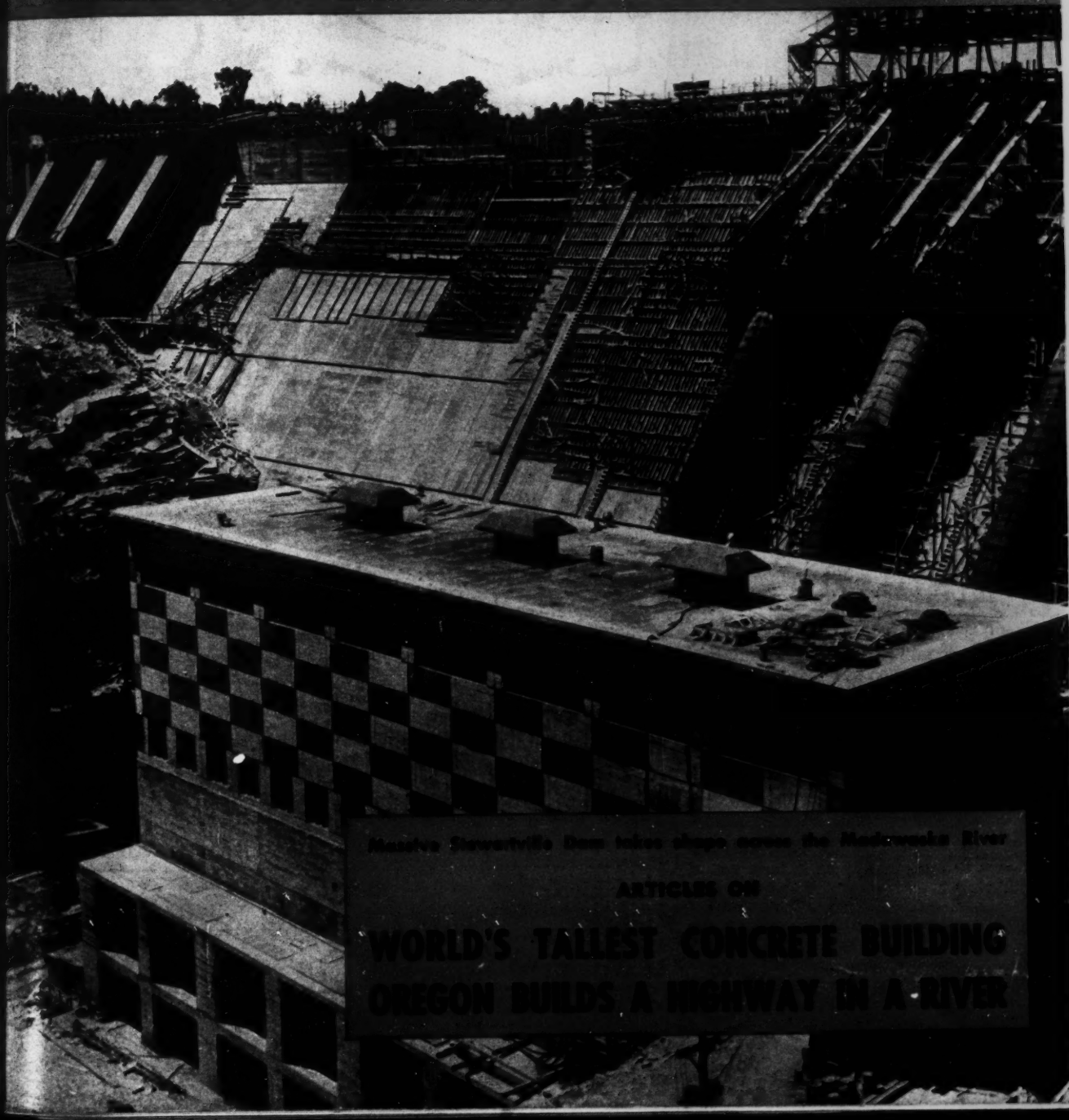
ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

SEPTEMBER 2, 1948

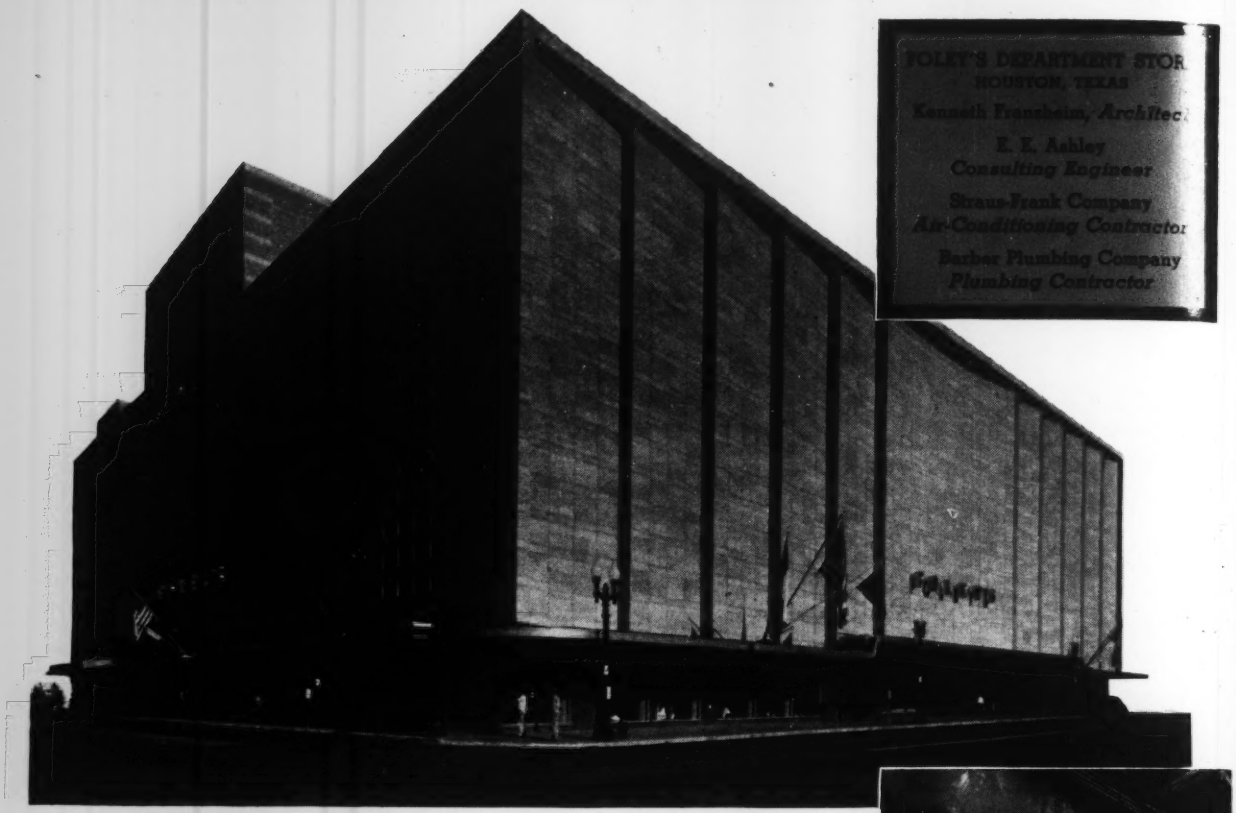


Massive Stevenville Dam takes shape across the Mankewaka River

ARTICLES ON

WORLD'S TALLEST CONCRETE BUILDING

OREGON BUILDS A HIGHWAY IN A RIVER



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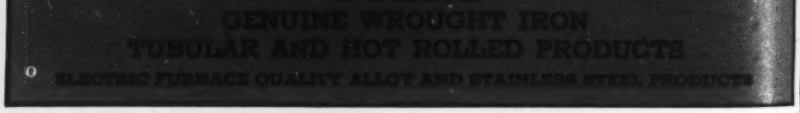
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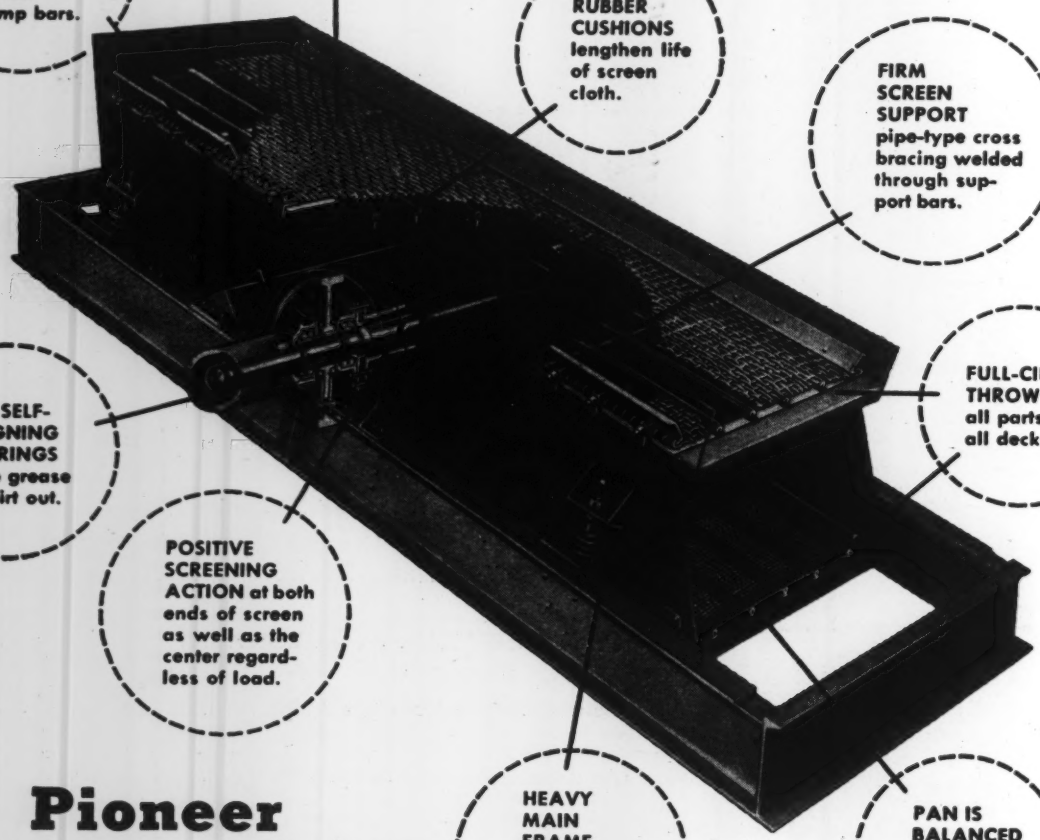

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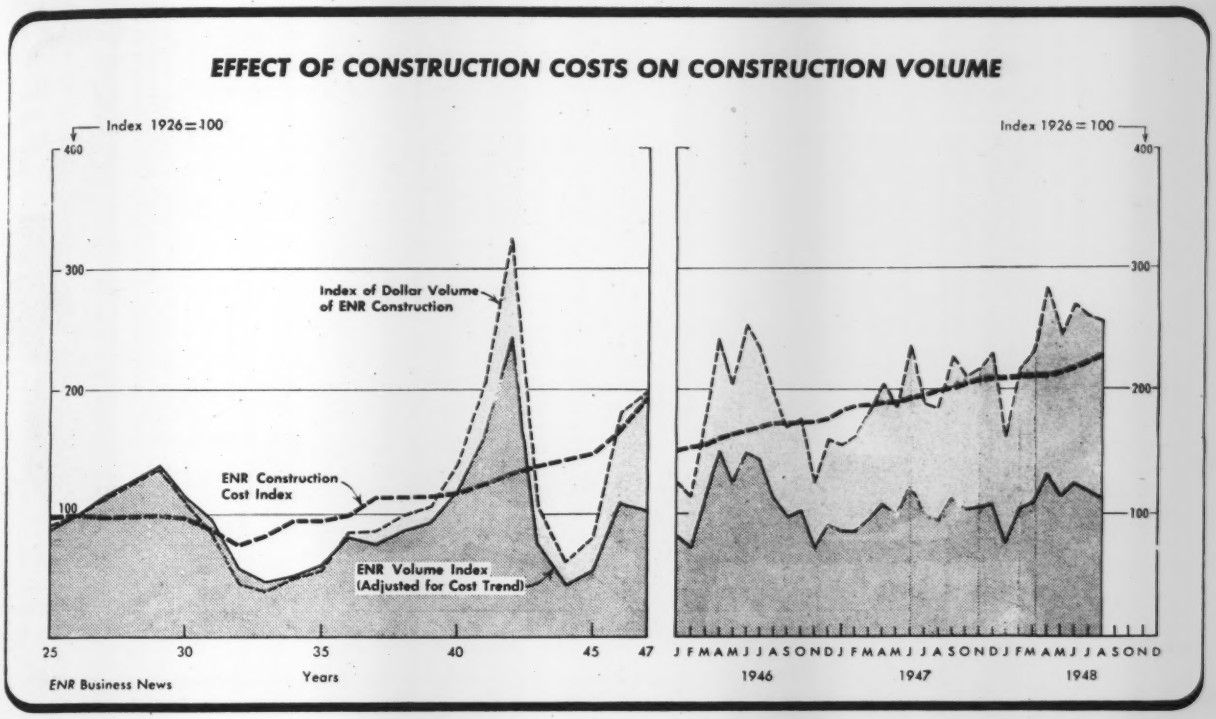


Construction Volume Well Maintained Despite Rise in Costs

Concurrent with a rise of 7 percent in the average cost of construction this year over a year ago, the dollar volume of heavy engineering construction, as reported by *Engineering News-Record*, rose to $4,607,380,000 in the first eight months of this year, or 28 percent above the corresponding 1947 volume of $3,611,597,000. The physical volume of construction during this period was 13 percent above a year ago. *Engineering News-Record's* volume index, on the basis of 1926 as 100, rose to 110 in 1948 from 97 in 1947. The volume index is adjusted to take into account changes in the cost of construction.

The physical volume of construction from January to August this year, however, was still 7 percent below the corresponding construction volume in 1946, a year in which a peacetime record was made. For the first eight months of 1948, *Engineering News-Record's* volume index of 110 was 8 points below the 1946 eight months average of 118.

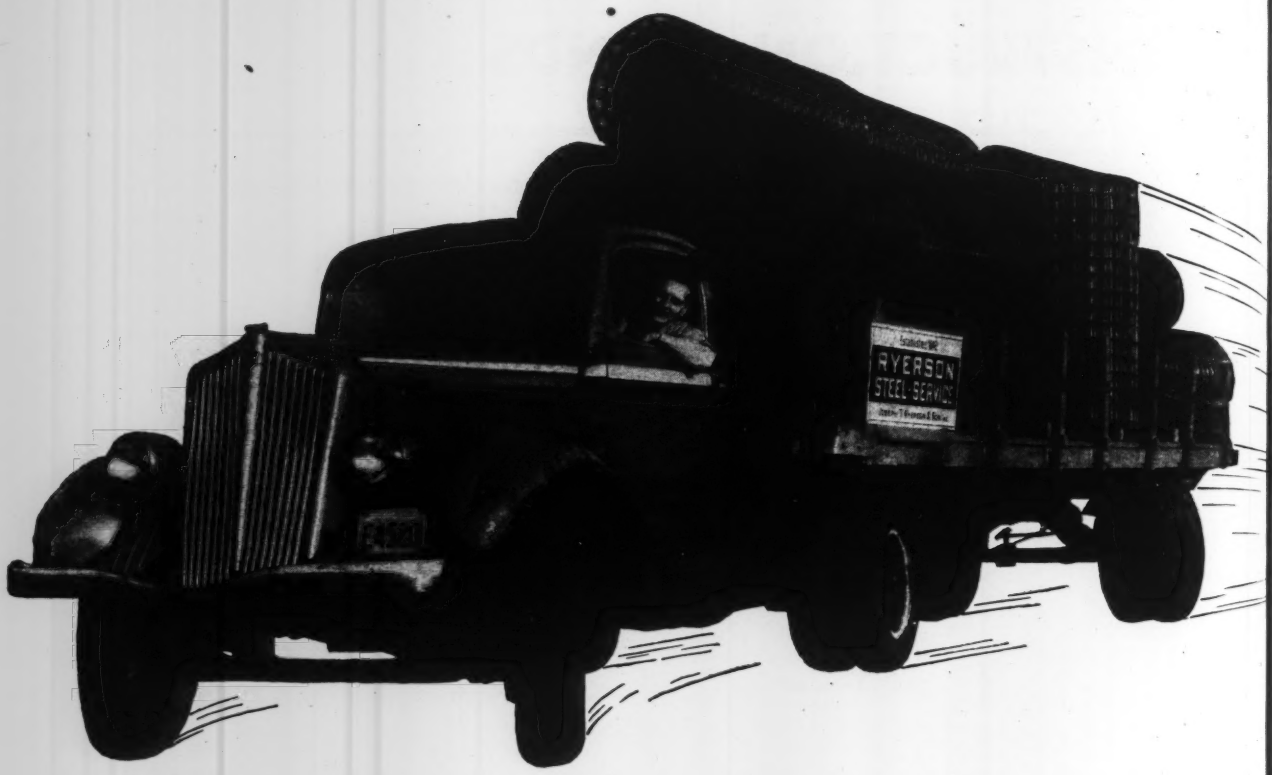
If the awarding of heavy engineering construction contracts is maintained at the August rate and construction costs show no marked gains for the remainder of the year, the 1948 average of the physical volume of construction may approximate the 1946 record peacetime volume. The volume index averaged 109 for the whole year of 1946 as against 118 at the end of August, as the result of a slackening of construction activity in the last four months of the year.

A warning, however, is sounded by the high level of construction costs which is pricing many projects out of the market. For example, the intended construction of a $90,000,000 apartment house in the East by a large insurance company has been deferred due to prohibitive costs, and an $80,000,000 synthetic gas and chemical plant project of the Stanolind Oil and Gas Company has been indefinitely postponed. Similar moves may be forthcoming elsewhere as a protest against high construction costs.

Construction costs, as measured by *Engineering News-Record's* Construction Cost Index, rose over 7 percent so far this year, to 228.58 in August from the December 1947 index of 212.05, based on 1926 as 100. The purchasing power of the construction dollar in August was thus only 44 percent of 1926 values.

Two-thirds of this 7 percent rise can be attributed to increases in the cost of labor as the result of the third round of wage increases granted construction workers earlier in the year. *Engineering News-Record's* 20-cities average of common labor wage rates, the labor component in the Construction Cost Index, rose to $1.386 per hour in July and August from $1.272 in December, 1947, a gain of 9 percent.

The material cost component of the *Engineering News-Record* Cost Indexes, reflecting the changes in the prices of steel, cement and lumber, showed only moderate fluctuations during the first seven months of this year. The increase in material costs from July to August, accounts for only one-third of the total rise in construction costs so far this year.



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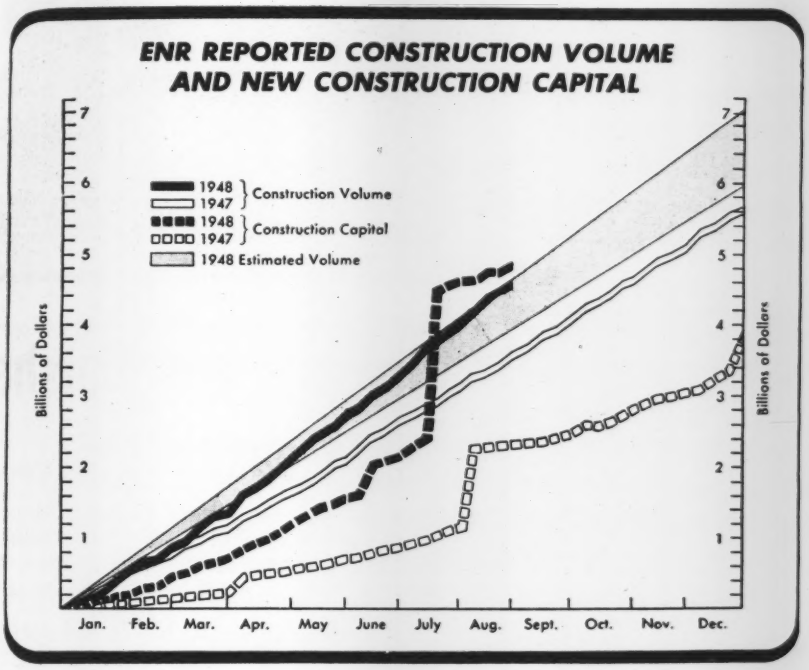
New Construction Volume in August


ENR REPORTED CONSTRUCTION VOLUME
AND NEW CONSTRUCTION CAPITAL
1948 } Construction Volume
1947 }
1948 } Construction Capital
1947 }
1948 Estimated Volume
Billions of Dollars
Billions of Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Civil engineering construction volume in continental United States totals $560,292,000 for August, an average of $140,073,000 for each of the four weeks of the month. This average is 2 percent below the average for July, 1948 but 36 percent above the average for August, 1947, according to *Engineering News-Record.*

Private construction for August on a weekly average basis is 20 percent below last month but 3 percent above August, 1947. Public construction is 16 percent above last month and 73 percent above last August. State and municipal construction is 13 percent above last month and 73 percent above the average for August, 1947. Federal construction, 29 percent above last month, is 75 percent above August, 1947.

Weekly averages in the various classes of construction for August, 1948 compared with July, 1948, show gains in earthwork and drainage, of 127 percent; waterworks, 112 percent; industrial buildings, 46 percent; sewerage, 30 percent; bridges, 17 percent; highways, 13 percent. Losses are recorded for public unclassified, of 4 percent; public buildings, 15 percent; commercial buildings, 28 percent; private unclassified, 41 percent.

Geographically, four sections showed gains in August, 1948 over July-New England, 37 percent; Middle West, 16 percent; Far West, 15 percent; Middle Atlantic, 7 percent. The South dropped 18 percent and West of the Mississippi, 20 percent.

All the sections made gains in August over August, 1947—New England, 153 percent; West of the Mississippi, 90 percent; Middle West, 30 percent; South, 18 percent; Middle Atlantic, 14 percent; Far West, 13 percent.

New capital for construction for the four weeks of August, 1948 totals $246,934,000 or a weekly average of $61,734,000 for the month. The weekly average is thus 88 percent below the weekly average of $500,735,000 for July, 1948 and 155 percent above the weekly average of $24,187,000 for August, 1947.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD

Engineering News-Record *reports continental U.S. Construction projects of the following minimum costs-Waterworks, excavation, drainage and irrigation,* $ 28,000, *other public works* $ 50,000, *industrial buildings,* $ 68,000, *other buildings,* $ 250,000

Thousands of Dollars (000 Omitted)

Public Work	August, 1948 New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	Total U.S.	U.S. Cumulative Eight Months 1948	1947	% Change '47 to '48	Canada Aug. '48
Waterworks	362	10,543	3,910	506	3,918	1,628	20,867	131,612	73,981	+ 78	1,017
Sewerage	423	7,165	2,488	3,039	4,359	8,394	25,868	153,440	90,515	+ 70	818
Bridges, public	5,024	7,003	3,613	4,262	1,970	3,313	25,185	195,367	115,052	+ 70	243
Earthwork and waterways	.....	1,535	7,440	2,613	12,847	26,129	50,564	350,910	198,740	+ 77	684
Street and roads	8,503	28,415	14,272	20,507	23,007	9,442	104,146	699,402	544,238	+ 29	7,150
Buildings, public	4,079	17,957	6,100	20,097	25,461	9,584	83,278	714,521	390,202	+ 83	20,831
Unclassified, public	4,753	5,319	2,686	2,409	3,693	2,009	20,869	150,748	180,341	- 16	10,264
Total public	23,144	77,937	40,509	53,433	75,255	60,499	330,777	2,396,000	1,593,069	+ 50	41,007
Federal government (included in above classifications)	267	4,212	6,981	8,842	29,299	27,959	77,560	679,609	453,073	+ 50	.....
Private											
Bridges, private	.....	.....	.....	.....	.....	.....	.....	2,485	824	+ 202	.....
Industrial buildings	2,667	11,529	10,825	24,751	15,619	3,956	69,347	649,978	560,376	+ 16	5,800
Commerical buildings	6,047	48,298	11,691	6,141	26,282	10,529	108,988	1,262,811	1,166,666	+ 8	8,467
Unclassified, private	548	8,867	3,837	7,988	28,783	1,157	51,180	296,106	290,662	+ 2	240
Total private	9,262	68,694	26,353	38,880	70,684	15,642	229,515	2,211,380	2,018,528	+ 10	14,507
Total Engineering Construction											
Aug. 1948 4 weeks	32,406	146,631	66,862	92,313	145,939	76,141	560,292	.....	.....	.....	.....
July 1948 5 weeks	29,640	172,046	101,602	98,275	229,058	83,098	713,719	.....	.....	.....	60,648
Aug. 1947 4 weeks	12,814	129,031	56,451	71,257	76,725	67,216	413,494	.....	.....	.....	19,034
Eight months 1948	210,230	1,268,873	720,568	568,690	1,199,587	639,432	.....	4,607,380	.....	+ 28	307,329
Eight months 1947	134,171	934,269	637,597	496,262	807,707	601,591	.....	.....	3,611,597	.....	299,118
% Change '47 to '48	+ 57	+ 36	+ 13	+ 15	+ 49	+ 6	.....	.....	.....	.....	.....

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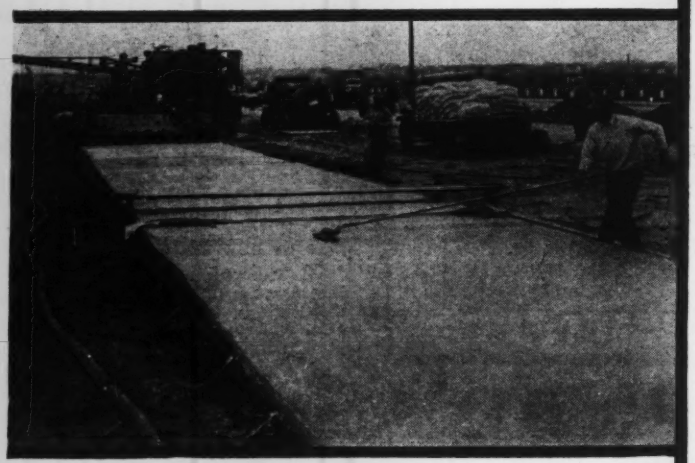

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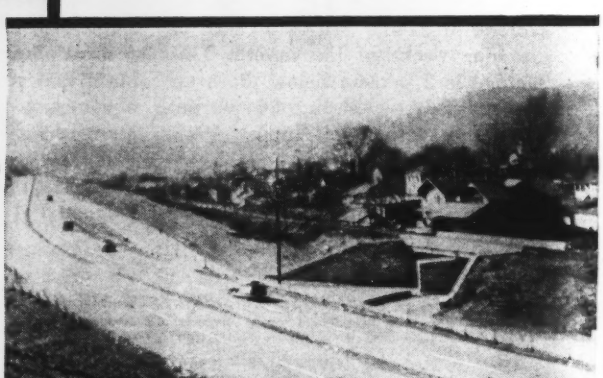

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News of the Week

ENGINEERING NEWS-RECORD • SEPTEMBER 2, 1948 • VOLUME 141 • NUMBER 10

St. Louis comptroller blocks hiring consulting engineers

City officials told to pay more for present engineering employees of Board of Public Service and do sewer work with its own forces

A proposal to hire consulting engineers to prepare plans for storm relief sewers in the northwestern section of St. Louis was blocked on Aug. 28 when Louis Nolte, comptroller, flatly refused to permit $25,000 in city funds to be set aside for hiring outside consultants.

Mayor Kaufmann had sought to retain the services of Horner and Shifrin, consulting engineers, St. Louis, to do the engineering work on the first stage of trunk relief sewers for part of the city.

Mr. Nolte said that the city should use its own engineers for this work, and that if the present salaries being paid by the city for engineers are not sufficiently attractive to obtain needed men, then the wage scale should be advanced.

City engineers underpaid

Milton M. Kinsey, President of the Board of Public Service, said that the city's engineering staff already has more work than it can handle and has been unable to obtain new men because the salaries paid to engineers by private firms range 60 percent and more above the city scales, and in the higher brackets two and three times the city's rates.

After Mr. Nolte declined to declare a public emergency to pave the way for the $25,000 appropriation, Mayor Kaufmann instructed Mr. Kinsey to seek revision of the city's wage scales for engineers and other technical workers.

The engineering firm of Horner and Shifrin has stated that it can obtain the necessary engineers to complete plans for trunk and lateral relief sewers for both the Harlem Creek and Baden sewer districts in the northwest and northern portions of the city. President Kinsey advised the Board of Estimate and Apportionment. Complete plans for these projects would cost about $255,000 and take some 30 months to prepare. Construction of the sewers, Mr. Nolte said, would cost the city $10,500,000.

The comptroller also stated that he believes any plan for new sewers in the affected areas should include arrangements for St. Louis County residents who use city sewers to pay part of the cost of the construction and maintenance work.

Engineers to be exempt under draft regulations

Professional engineers and scientists are put in a deferred classification under the draft regulations announced last week by President Truman. Provision for deferring technical students has not been fully worked out, but it is expected to be liberal.

Deferment policies were drawn up by the National Security Resources Board. President Truman accepted the board's demand that the division of manpower between industry and the military be made at top national level by civilian experts in all respects independent of the Director of Selective Service. This new approach could have large meaning in event of a bigger draft.

Research aims at code standardization

A new division of standardized codes and materials in the Housing and Home Finance Agency will carry out the research program authorized by the Housing Act of 1948, signed Aug. 10 (*ENR*, Aug. 12, p. 3). Congress appropriated $300,000 for technical research and studies to promote development and acceptance of uniform building codes and standardized dimensions and methods of assembly for building materials and equipment.

Leonard G. Haeger, the St. Louis architect who has headed the HHFA technical staff for the last two years, is director of the new division. His tentative plans call for setting up sections headed by specialists in the fields of codes, materials and modular coordination. The division is taking steps toward inviting advisory committees from private industry to give guidance to its research programs in the three sections.

Announcing the creation of the new division, administrator Raymond M. Foley said, "Considerable work in codes and standards has already been launched under the program of the HHFA technical staff. That work will be continued and expanded in the program authorized by Congress. To carry out this program, HHFA is authorized to utilize available facilities of other government agencies, such as the National Bureau of Standards, the Department of Commerce, and the Forest Products Laboratory of the Department of Agriculture."

An example of continuing research activities is the work on the uniform plumbing code (*ENR* Apr. 24, 1947, vol. p. 709) by a committee set up in 1946 representing the HHFA, the plumbing contractors, the journeymen plumbers, the U. S. Public Health Service and the National Bureau of Standards, aided by an advisory committee that represents other federal departments and agencies. This committee in cooperation with HHFA and the Department of Commerce, is conducting tests at the Bureau of Standards to expand its plumbing code for housing into a code applicable to all installations.

More than 5,000 copies of the Uniform Plumbing Code for Housing have gone out to cities, towns and construction groups. It is reported that some 1,500 municipalities have adopted—or have taken steps to adopt—the code in whole or in part. Sixteen copies of the sound moving picture, "Toward a uniform Plumbing Code," are heavily booked several months ahead.

Putting a special section on modular coordination in the HHFA research division will give added sponsorship and fresh energy to the drive toward dimensional coordination of structural design and building products on the basis of a 4-in. module.

NEWS BRIEFS

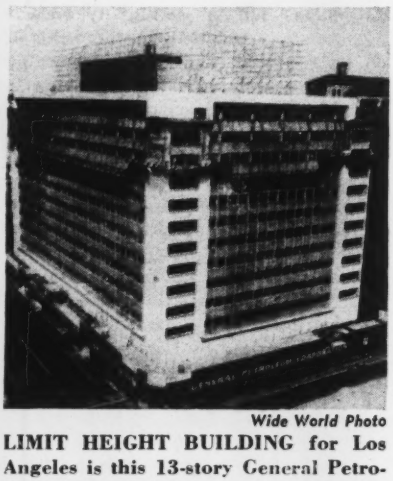
Housing—Massachusetts State Housing Board has approved sites for two low-rent projects in *Brookline* for 220 families and a 168-unit project in *Watertown* . . . Ground has been broken for a $2,000,000 apartment project at *St. Petersburg Beach, Fla.* . . . *Philadelphia, Pa.*, has issued permits for 48 two-story stone and brick houses in the northeast section—The housing authority of *Fitchburg, Mass.*, plans to build 160 low rent units for veterans . . . Phillips Petroleum Co. will erect a 206-unit apartment building at *Bartesville, Okla.* . . . A $1,500,000 subdivision and shopping center will be built on Post Oak Road, *Houston, Tex.*, by C. P. and J. P. Simpson.

Public Construction—Southern Illinois University, *Carbondale*, Ill., is planning an $11,000,000 building expansion program . . . Construction has started on two tunnels to divert water from the Ouachita River near *Hot Springs, Ark.*, while Blakeley Mountain Dam is being built . . . At *Point Pleasant, W. Va.*, a $2,500,000 flood wall has been started . . . *Maryland* Board of Mental Hygiene has proposed a $24,000,000 building program at five mental institutions in the next two years . . . There are plans to build or expand 15 non-profit hospitals in *Kentucky* . . . In November *New Jersey* voters will be asked to approve a $50,000,000 bond issue for additions to state hospitals, Rutgers University and several teachers' colleges . . . Early construction is planned for three elementary schools in *Duval County, Fla.* . . . Actual designing of the $208,000,000 *Southeast Florida* water control project may start soon . . . The public school system of *Denver, Colo.*, will get a $21,000,000 face-lifting under plans announced by the superintendent.

Industrial Construction — Chesapeake & Ohio Ry. Co. will spend $8,000,000 on a new coal pier on the James River at *Newport News, Va.* . . . An 8,000,000 cu. ft. refrigerated warehouse (said to be the world's largest) is being built by Alford interests in *Dallas, Tex.* . . . Refinery expansion by Continental Oil Co. at *Ponca City Okla.*, will cost about $7,750,000 . . . Southwestern Bell Telephone Co. will occupy most of a new 16-story building at *Houston, Tex.*, and in the same city work has started on a $2,000,000 plant for the Wright Mfg. Co. . . . Work is beginning on the $2,500,000 foundry plant for the American Foundry Co. in *Indianapolis, Ind.* . . . The N. Y. State Public Service Commission has given full authorization to the Home Gas Co. of *Binghamton, N. Y.*, to finance a $3,000,000 construction program.

Bridges—A $5,000,000 deck cantilever truss bridge 3,600 ft. long is being planned to cross the Maumee River at *Toledo, Ohio* . . . Ohio River bridge at *Cairo, Ill.*, will become toll-free Nov. 11. . . . Plans for a new highway bridge across the Susquehanna River at *Harrisburg, Pa.*, are being pushed by the state highway department. It will connect Dock Street Harrisburg, and Lowther Street, Lemoyne and will be a free bridge. Two toll traffic bridges span the river at Harrisburg at present.

Labor—Carpenters in *Omaha, Neb.*, have received a 7½-cent raise to $1.82½ an hour . . . Union bricklayers and electricians in *Dayton, Ohio*, have the highest wages among seven building crafts in 25 north central cities, according to Bureau of Labor statistics . . . Street, sewer and garbage department workers at *Gary, Ind.*, were striking for higher pay early in the month . . . Common building laborers in *Lexington Ky.*, threaten to strike to get their wages raised from $1.00 to $1.25 an hour . . . The 46-day-old strike of cement-truck drivers, which has slowed construction in the *Buffalo, N. Y.*, area ended Aug. 16 when Local 449 of the AFL Teamsters Union approved an agreement with six concrete-mixing firms. It was understood that the drivers were given the 25-cent hourly wage hike that they had demanded.



Wide World Photo

LIMIT HEIGHT BUILDING for Los Angeles is this 13-story General Petroleum Corp. building, one of three new office buildings under construction in that city at an average cost of over $7,000,000 each. Purpose of the 150-ft. height limit on all buildings is to force the city to spread.

AISC resumes awards for beautiful bridges

The American Institute of Steel Construction, resuming a custom interrupted by the war, will sponsor again this year the selection of the most beautiful recently constructed bridges.

Because of the lapse of time since the last competition, all bridges will be eligible that have been completed and opened to traffic between Jan. 1, 1942 and Jan. 1, 1948.

There will be four classes of bridges, depending upon size and type, upon which awards will be made. Judging will take place in the New York office of the AISC on Sept. 15, and will be by a special jury of awards comprising two engineers—Prof. A. H. Fuller, Iowa State College and Waldo G. Bowman, editor of *Engineering News-Record* and *Construction Methods*—and three architects,—Frederick W. Dunn of St Louis; George H. Bond of Atlanta and Douglas Orr of New Haven, president of the American Institute of Architects.

Give broadcasting awards for traffic safety work

Recognizing radio's role in highway safety, the Alfred P. Sloan Foundation is offering ten awards to networks and stations for outstanding service in traffic accident prevention during the current year.

The Automotive Safety Foundation will administer the award program.

Local, regional and clear-channel stations and regional and national networks, as well as individual radio programs, are eligible for the new honors. Five of the awards, in the form of commendatory plaques, will be given for commercial programs and five others for sustaining programs.

Recipients of the awards will be selected by a safety foundation jury.

CAA tests show tung oil is good soil stabilizer

Tung oil can be effectively and economically used as a stabilizing agent for sandy loam in the construction of airstrips or highways, according to recent findings of the Civil Aeronautics Administration.

CAA engineers, in a project initiated during the war, have found from their tests that the oil (commercially available in several countries) is most satisfactory in binding together and water proofing loam or sandy loam. Addition of potassium sulfate, calcium stearate and zinc stearate to the oil tends to improve the strength of soil treated.

Traffic engineering courses sponsored by National Institute at universities

Regional institutes throughout the country to offer undergraduate, graduate and in-service training to supplement courses given as part of civil engineering programs

Short courses in traffic engineering soon will become more accessible to engineers and traffic officials in various regions of the country, if plans for expansion of the National Institute for Traffic Training go forward as expected. Regional institutes are proposed in the East, South, Southwest and Far West—and possibly in other areas—to supplement the National Institute held at Northwestern University, Chicago.

Less than 30 percent of U. S. cities with populations of 50,000 or more have traffic engineers. Authorities estimate that at least 275 more traffic engineering positions should be created, with thorough training in the subject required of applicants.

Training is subdivided

Three levels of training are offered in traffic engineering: graduate, undergraduate and in-service. Colleges and universities will conduct the institute.

The Bureau of Highway Traffic at Yale University offers one-year graduate training for qualified engineers and others whose experience qualifies them for the course. Since its establishment at Harvard University in 1926 and its later transfer to Yale, the bureau has trained about 200 men in the full academic year courses and about 40 army transportation officers in one-semester courses. It also has stimulated the application of traffic engineering principles through cooperation with the Institute of Traffic Engineers and other agencies in conducting regional and state courses and training conferences.

Undergraduate study in traffic engineering is offered at several leading institutions of higher learning—including Purdue, University of Michigan, Louisiana State, Cornell and Iowa State—as electives in the civil engineering department.

In-service training includes the annual National Institute for Traffic Training, held this year at Northwestern University, July 12-23, and the training conferences sponsored by Yale and ITE, between themselves and in cooperation with other organizations.

Plans now afoot to amplify the institute's training service will put it on a regional basis, with at least one college in each section of the country conducting an institute, in order to make the training accessible to many more people.

More schools needed

Training offered at the Institute is of real practical value, but it in no sense takes the place of formal training offered at Yale. There is need for more training centers like the Yale bureau and for undergraduate training in more colleges and universities.

The full program of the National Institute for Traffic Training includes courses on traffic police training, accident records, chemical tests for intoxication, driver education, fleet supervisor training, and pedestrian protection, in addition to traffic engineering. Several courses are open to state, county and city officials and to other personnel concerned with the specific subjects. Enrollment in this year's institute at Northwestern was 239. Over the years, a total of 1,502 have taken courses at the ten national institutes. This year, the most popular course, fleet supervisor training, had 54 enrolled.

California highway institute opens

The Institute of Transportation and Traffic Engineering of the University of California is planning initial courses in highway and traffic engineering beginning with the fall semester, according to Prof. Harmer E. Davis, acting director.

Formation of the institute, a division of the school of engineering, was made possible by action of the 1947-48 state legislature to carry on "instruction and research related to the design, construction, operation, and maintenance of highways, airports, and related facilities for public transportation."

The new classes at the Berkeley campus will be the first formal sessions of the institute on the collegiate level after a several months organizational period for which $355,000 was appropriated. They will implement the aim of the institute to prepare trained engineers for service in all phases of public transportation in federal, state, country, and city agencies and private industry.

In addition to offering undergraduate work leading to a B.S. degree in civil engineering in the transportation field, the institute plans to carry on its program by in-service or extension type courses, by developing information to serve as a basis for discussion of specific problems in specific localities, by offering graduate study and by research of a fundamental nature. Illustrative of the extension type of courses is a short course on the design and control of asphaltic pavement mixtures held on six Saturdays during the months of June and July.

Regular extension courses are also planned as are sessions or forums on specific subjects covering 2 to 5 days. Three recent meetings of this latter type that the newly formed institute participated in along with other university departments and outside agencies are the California traffic engineering conference, a motor vehicle fleet supervisors' training course, and a "workshop in safety and driver education for high school teachers."

Although planning of the research program is still in the early stages, an accident research program on the Los Angeles campus of the universsity is being considered. This study will involve psychological and physiological phases of accidents as well as the more familiar engineering problems involved.

Except for the acting director, Prof. H. E. Davis, major staff appointments have not been announced.

Wide World Photo

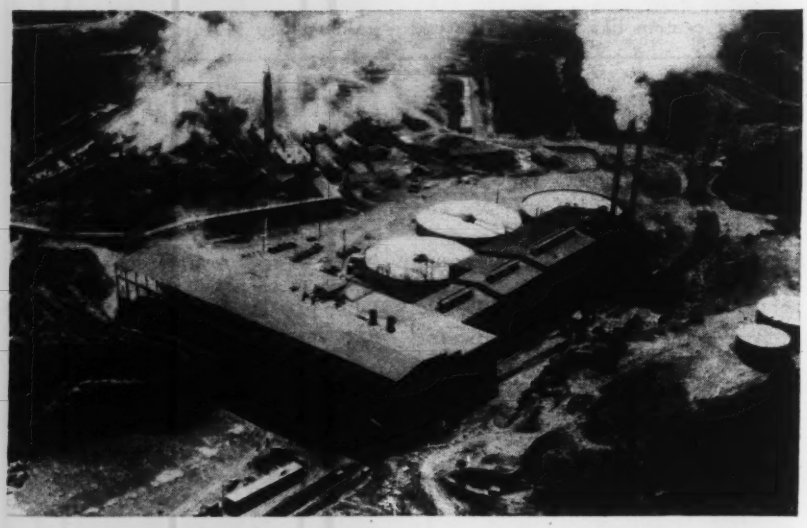
GERMAN-BUILT CRANE—This floating giant rebuilt by the U. S. Navy towers 375 ft. above its 205-ft. long pontoon at San Pedro, Calif. Operator sits 100 ft. above the waterline.

Lead plant charged with smoke law violation

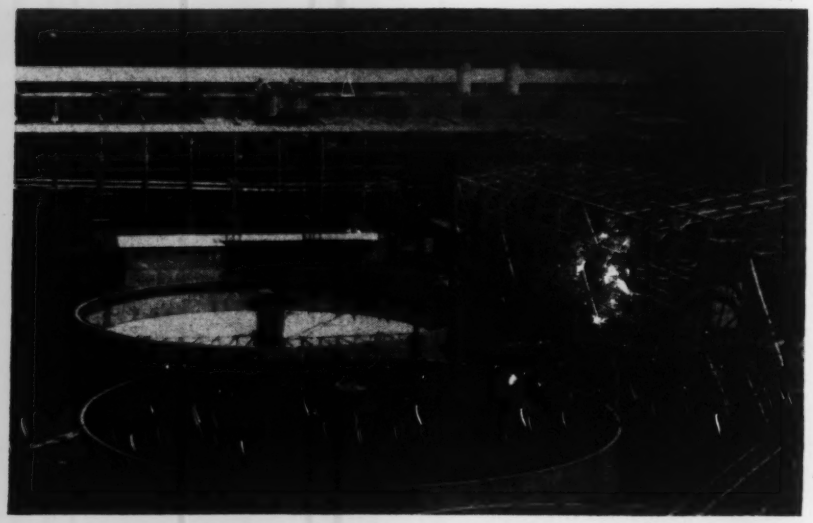
Charges of emission of dense smoke and discharge of lead oxide beyond tolerable limits have been filed by the Los Angeles County Air Pollution District's hearing board by Dr. Louis C. McCabe, smog-control director, against Morris P. Kirk & Son Inc., major Los Angeles lead plant.

The charges, filed under the state health and safety code, of which the smog-control law is a part, must be heard within 30 days. The petition asks that the company's operating permit be revoked, charging that emissions from Kirk's huge stack are at times three times the legal limit. Among the 13 specific accusations are one that 100 percent opaque smoke was emitted for 15 minutes in an hour, and charges that 32 and 39 minutes, respectively, of 80 percent opaque smoke were observed.

Kirk submitted smoke samples showing the lead discharge to be about one-third above legal maximum but McCabe's own samples indicated triple the legal limit of lead oxide emission. The law permits emission of "dense" smoke for not more than 3 minutes out of an hour.



WESTERN CEMENT MILLS—Aerial view shows new $6,000,000 "wet process" cement mill at Portland, Colo., in the foreground, which, together with the 35-year-old mill in the left rear, produces 24,000 bags of badly needed portland cement daily.



INCREASE PRODUCTION—A second "wet process" mill under construction in northern Utah will double output of the existing 40-year-old plant at that site. Local limestone is ground sufficiently for 90 percent of it to pass a 200-mesh sieve.

Form California group to study water pollution

In order to present the views of industry on the problems of water pollution and industrial waste disposal in California, the California Association of Production Industries, Inc., has been formed, with headquarters in San Francisco.

The association, representing those industries which create or are affected by waste products, hopes to find an "economically desirable" solution for the problems of industrial pollution of water resources, Luther A. Nichols, executive vice-president, explained.

H. C. Davis, president of Terminal Island Sea Products, Inc. heads the organization. F. C. van Deinse, president of Gold Producers of California, is vice-president, and Albert F. Knorp, secretary-treasurer of the American Mining Congress, is secretary. W. J. O'Connell & Associates act as consulting engineers for the association.

The organization, Nichols said, is trying to show its member-industries and the public how wastes originate, in an effort to find an "equitable plan of control," satisfactory to public health and the industries involved.

Montana has big program for its road department

Montana must spend $6,500,000 annually for the next few years to maintain the present highway system, buy rights-of-way, administer the department and service outstanding bonds, state highway officials estimate. Income is estimated at $6,800,000 annually.

Department figures place annual maintenance on the present system at $5,250,000. About $250,000 annually will go for rights-of-way for new roads and realignment, and $400,000 for administration and other overhead. Present bonds, which will total $6,500,000 after the $3,000,000 sale scheduled June 22, will require $750,000 annually for servicing. New construction must come from the $150,000 remaining each year.

The 1947 legislature authorized issuing of $12,000,000 in debentures. If the remainder of this authorization is issued, as highway officials agree must be done if federal-aid allotments are to be matched, servicing of the bonds will rise to $1,500,000 annually.

State Highway Engineer Scott P. Hart said that, if this is accomplished, highway expenditures for normal purposes must then be curtailed for the remainder of the 10 years during which the debt is to be retired, unless additional sources of revenue are found.

Navy expands Seabee active reserves

The Navy has reorganized its Seabee Reserve program to stay within appropriation limitations and still provide training for larger nu.nbers of men. The 30th Congress approved expansion of the program.

Captain O. A. Sandquist, director of the Civil Engineer Corps Reserve, announced last week that each of the 123 organized reserve companies already activated will be reduced for the remainder of fiscal 1949 from five officers and 40 enlisted men (as previously authorized) to five officers and 35 enlisted men.

No men will be dropped to come under the ceiling. Instead, the first five vacancies caused by normal attrition will be left unfilled. Reorganized companies will total 615 officers and 4,305 enlisted men obligated to attend 48 paid drills per year.

Besides the reorganizing existing units, Captain Sandquist announced the forming of 24 new organized Seabee companies of five officers and 40 enlisted men each Members of these units will attend 12 drills annually.

Organization of these experimental units is an attempt by the Civil Engineer Corps and the Bureau of Yards and Docks to retain the interest of reserve CEC officers and former Seabees whose business interests are too time-consuming to permit them to attend weekly drills. The Navy hopes that many reserves of high caliber, who otherwise could not take part, will sign up for the program.

There are only two training centers where Seabee reserve officers and men may put in two weeks of active duty training.

MAJOR MEETINGS

Canadian Good Roads Association, annual convention, the Pines Hotel, Digby, N. S., Sept. 7-9.

Businessmen's Conference on Urban Problems, Hotel Statler, Detroit, Mich., Sept. 13-14.

Associated General Contractors of America, mid-year meeting of Governing and Advisory Boards, Edgewater Beach Hotel, Chicago, Ill., Sept. 13-15.

Iowa Sewage Works Association, Hotel Kirkwood, Des Moines, Iowa, Sept. 14-15.

New England Water Works Assn., annual convention Hotel Pennsylvania, New York City, Sept. 14-17.

Engineer and Architects Association, Hollywood Roosevelt Hotel, Los Angeles, Calif., Sept. 24-26.

American Institute of Steel Construction, annual convention, Chateau Frontenac, Quebec, Can., Oct. 4-7.

Concrete Reinforcing Steel Institute, semi-annual meeting, Grove Park Inn, Asheville, N. C., Oct. 5-9.

American Society of Photogrammetry, semi-annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., Oct. 7-8.

Southwest Section, A. W. W. Assn., Buccaneer Hotel, Galveston, Tex., Oct. 10-13.

Institute of Traffic Engineers, annual meeting, Hotel Warwick, Philadelphia, Pa., Oct. 11-13.

Building Officials Conference of America, annual meeting, Hotel New Yorker, New York City, Sept. 13-16.

Arizona Sewage & Water Works Assn., Hotel Westward Ho, Phoenix, Ariz., Oct. 15-17.

Federation of Sewage Works Associations, with annual meeting **Michigan Sewage Works Association,** Hotel Statler, Detroit, Mich., Oct. 18-21.

American Welding Society, annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. Week of Oct. 24.

U. S. acts to effectuate housing steel allocation

Final step toward placing in effect the voluntary steel industry allocation of 59,000 tons of steel sheet and strip —other than enameling grades—to manufacturers of factory-made steel houses was taken last week by the Office of Industry Cooperation, U. S. Department of Commerce.

The plan has been approved by the attorney general, and the secretary of commerce has mailed requests for compliance to all proposed participants. Acceptance of these compliance requests is required from participants to give them immunity under the anti-trust laws and the Federal Trade Commission Act.

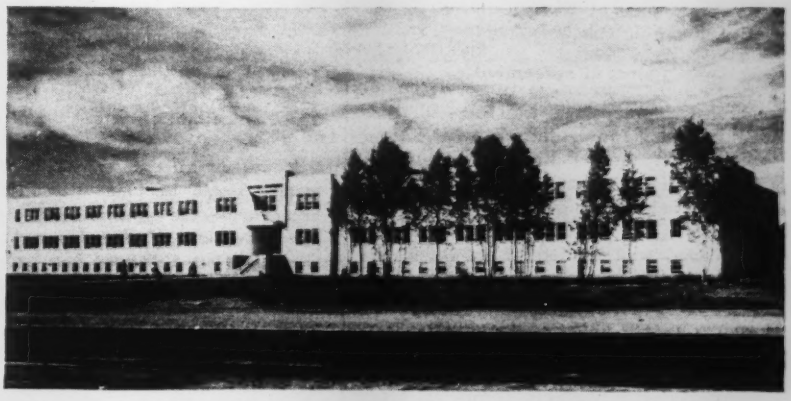
Purpose of the voluntary plan is to provide the six manufacturers of factory-made steel houses with sufficient steel to give adequate demonstration of the utility and practicability of each particular type of house, and to determine whether or not this type of home furnishes an answer to demands for low-cost housing (ENR, Aug. 19, p. 73).

New fluorescent lamps to reduce lighting costs

A fluorescent lamp improvement has been announced by the lamp departments of both the General Electric Co. and the Westinghouse Electric Corp., which it is believed will reduce electric lighting costs for many industrial and commercial concerns.

According to the companies' illuminating engineers, consumers who have been using 100-watt fluorescent lamps hereafter will need to consume about 14 percent less current to obtain the same amount of light. The new lamps are 85-watt and existing 100-watt accessory equipment can be used with the new lamp.

Engineers attribute the increased efficiency of the new lamps to the use of krypton instead of argon as a fluorescent lamp filling gas.



THROUGH THESE PORTALS are to pass the invitations for bids on 70 million dollars worth of 1949 military construction in Alaska. Beginning in October and continuing through February, bids will be received and lump sum contracts let by Col. W. E. Potter, district engineer whose new office building at Ft. Richardson is pictured here. Involved are such items as living quarters, power plants, utilities and warehouses at Ladd Field, Ft. Richardson and other bases in Alaska. Nineteen separate contracts will range in size from a hundred thousand to ten million dollars, and include such special provisions as having the government furnish not only the materials but much of the construction equipment. Col. Potter, last week, wound up in New York a series of meetings held across the country to interest contractors in these jobs which are forerunners of an eventual billion dollar program in Alaska.

Random Lines *from an editor's notebook . . .*

. . . . recording closing-day impressions of the recent Road Show from the viewpoint of the equipment exhibitor.

With the exception of one major "gripe" which was loud in protest and almost universal in extent, the equipment-manufacturing exhibitors wrapped up the recent Road Show in Chicago and went home confident of a job well done. But they will long remember their ruthless exploitation by the "superadministration" of the city's Park District Board which provided the workmen and other services necessary to install, service and help remove the equipment on display.

Wages were high. Craftsman-efficiency was low. And confusion reigned in all too many instances during the early stages of the exposition.

For example, carpenters could be had—many of them reportedly of the jack-leg variety that could not even lay out a set of stair treads—for $4.10 per hour but only upon the promise of abundant overtime. During one tight squeeze under the duress of getting an exhibit set up on time, carpenters were paid an all-time high of $8.40 per hour.

Iron workers and painters charged only $25 to $28 per day; 5-gal water coolers cost $20 per day; 2-word signs could be had for only $1 each; while rental on a half-dozen chairs and a small rug in one exhibitor's booth cost $108 for the eight-day exposition.

"Truly," said one disgusted exhibitor, "the spirit of Al Capone has been revived for this show."

Points of agreement

Firm convictions of a number of the equipment manufacturers are (1) they don't want another Road Show for at least three years and (2) they don't want it held in Chicago. "Give us the wide-open spaces in Texas next time," said one, who scoffed at the idea of shortages in hotel accommodations in these days of auto courts and trailer camps in that part of the country.

But despite the many headaches involved in putting on this "largest of all construction equipment shows" a majority of the exhibitors were enthusiastic about its lasting effect on road building both in this country and abroad. Unquestionably, it will serve as a greater hypodermic to the entire road building industry than has any previous exposition.

Despite the busy construction season, top contractor-management was there. Buyer-interest ranged from mild to enthusiastic, depending in large degree upon the effectiveness of display and the variety of new equipment being shown.

International buyer interest was reported to be highly gratifying. The presence of over 1,000 representatives of 60 foreign countries, from Pakistan to Poland, augurs well for the export of American construction equipment.

See return of exhibit costs

While the manufacturers do not envision immediate increases in sales volume of equipment sufficient to offset the costs of exhibiting, confidence was expressed in several quarters that future sales will return such costs many fold.

In addition to new orders booked on the site (some reportedly on two-years delivery), and spirited on-the-spot sales of equipment on display in Soldier Field—as evidenced by the large number of "sold" signs hung on the equipment each day—the manufacturers benefited from another large but intangible standpoint.

Their research and development engineers, and their salesmen, as well as their equipment distributors had the unique opportunity of viewing in one area virtually all of the developments brought about in the construction industry during the past eight years.

Some manufacturers see little incentive for bringing out new models or making drastic changes in their particular lines of equipment during the next five years. In fact, some pilot models shown for the first time at Soldier Field will not get into large-scale production for one year to 18 months.

To sum it all up, the 1948 Road Show was, in general, a most gratifying success as indicated by curbstone comments of the exhibitors ranging all the way from the small manufacturer whose exhibit cost less that $2,500 to some of the largest who spent upwards of $100,000 to display over a million-dollars worth of equipment.

The only aura of unreality in the entire show, however, was the impeccable appearance of the vast breath-taking display of equipment, all spotlessly cleaned, freshly painted or even waxed—a far cry from that ever encountered on any construction job by this mud-shoe editor—*JRC*.

ALSO RECORDED. . . .

High on the list of laudable—but questionable—construction projects should come the effort of a group of residents of Washington state, who appeared at 14,408-ft. Mount Rainier determined to build a 25-ft. mound atop the peak. Spurred by local pride, they were determined to lift the peak above Colorado's 14,432-ft. Mount Elbert. National Park Service officials vetoed the project.

It was all perfectly logical, as filing systems should be. Mrs. Helen Hauck, secretary to the principal engineer of the White Plains, N. Y., public works departments, lost a diamond from her ring. A search of wash-basins, waste-baskets and other repositories failed, but a check in the office file revealed the diamond, neatly filed under "D", along with "drawings" and "drainage".

Height-of-something-or-other note: An Army engineer test of lubricants for vehicles has been smoothly dubbed "Operation Greaseball".

Ill-mannered feathered residents of Ottawa, Ont., are in for a rude shock when the city's new $3,400,000 stadium opens shortly. The 800 x ft. long, 75-ft. high, 22,000-customer grandstand was designed, according to city officials, with an eye toward providing as little accommodation as possible for pigeons.

Residents of Chester, Calif., took direct action to cut their taxes. When county supervisors called for bids on a new justice building, taxpayers got together, decided to donate their own labor, and bid $3,195 for the work—nearly $6,000 less than the lowest bid by a contractor. The bid was accepted.

Water-users at Moncton, N. B., got tired of fishing eels out of their household water pipes, and complained to city water officials. Investigation showed a crumbling concrete wall in the city reservoir was permitting the fish to get into water mains. A new wall put an end to the fishing.

New York State is the latest to recognize the official status of sidewalk superintendents. A state highway department news release concerning construction of a new bridge over the Unadilla River near Unadilla says: "Sidewalk superintendents should avail themselves . . . . of a sidewalk on the temporary bridge, which will be placed . . . in full view of the bridge construction activities."

National census made of sanitary facilities

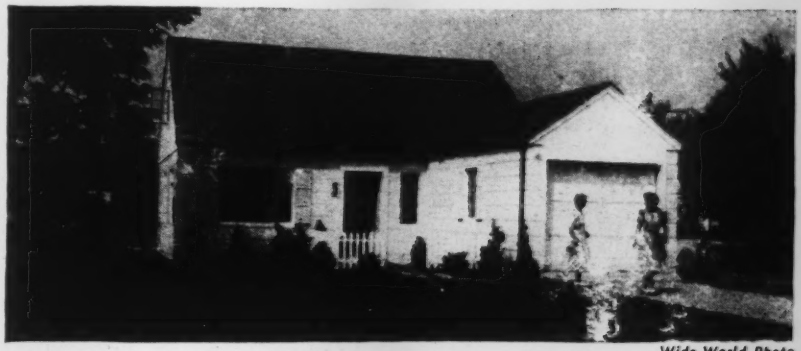
USPHS and states cooperate on complete and detailed report to be made available this month

"An Inventory of Water and Sewage Facilities in the United States" will be ready for distribution early this month, Oscar R. Ewing, Federal Security Administrator, announced late last week. The 900-page inventory was prepared by the Water and Sanitation Investigations Station of the U. S. Public Health Service in Cincinnati.

This census is the first comprehensive listing of the sanitary facilities of all U. S. communities. Part of the information—on water treatment plants, untreated water supplies, and sewerage systems—was available previously in separate publications, but communities without facilities were not listed. The present tabulation includes all incorporated places of over 100 population and all unincorporated communities of over 500 population. Thus the inventory gives current information on nearly all basic needs in the field of municipal sanitation, including details on sources of water, type of water treatment plant, sewerage facilities, and methods of treating sewage (or lack of such treatment) for each community included on its list.

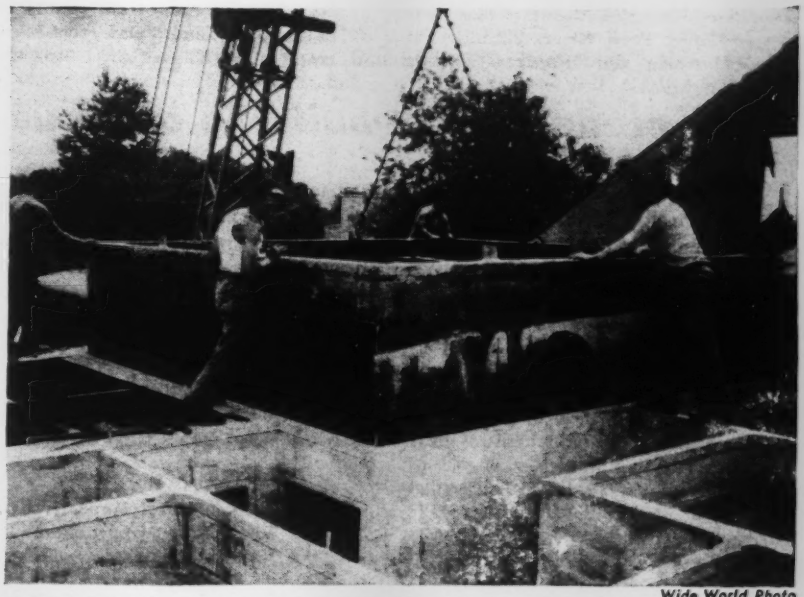
Assistant Surgeon General Mark D. Hollis, chief of the sanitary engineering division, said that the census was a cooperative project of USPHS and the sanitary engineering divisions of the state health departments.

The Cincinnati station of USPHS will furnish the report to state health departments, technical journals, libraries, manufacturers of sanitary equipment, consulting engineers, and others interested in environmental sanitation.



Wide World Photo

CONCRETE COTTAGE—This house, one of 150 to be built at Port Washington, Long Island, N. Y., by Callan Builders, Inc., is a monolithic concrete structure with structural lumber in the attic only. Effect of wood siding is given by a beveled exterior form.



Wide World Photo

LIVING ROOM core, weighing five tons is lifted by crane after poured walls have set. Exterior walls are of double thickness with asphalt impregnated insulating sheets between. Builder claims walls are vapor-proof and may be papered or painted directly.

Oil industry asks study of L. A. air pollution

Exhaustive scientific tests should be conducted to determine the exact composition and sources of air pollution in southern California before the oil industry is saddled with tremendous outlays for redesign and maintenance of refinery equipment. This is the opinion of W. L. Stewart Jr., president of the Union Oil Co. and chairman of the Petroleum Industry Committee on Smoke and Fumes.

Before a joint meeting with the Los Angeles County Air Pollution Control District recently, Stewart told Dr. Louis C. McCabe, director of the district, and executives of the oil industry that it was not yet known conclusively and scientifically what industry factors are most responsible for the smoke. He said the oil industry "has a feeling" that Dr. McCabe has placed too much emphasis on the factor of sulphur dioxide, which the oil refineries emit in large quantities.

The total emission of sulphur dioxide by refineries in the Los Angeles area has been estimated at 400 tons a day. This, Dr. McCabe has said, is transformed in the atmosphere into sulphur trioxide, the particles of which become the nuclei of "smog" as the dense smoke screen is called.

Water-wash processes for removing the sulphur dioxide from the refinery stacks would cost millions of dollars, and would involve problems of waste water disposal, Stewart said.

Decimal classification adopted by ASA

The American Standards Association has announced that it is adopting the practice followed by many of the foreign standardizing bodies and will classify American standards in accordance with the universal decimal classification system. By means of this classification. American standards can be easily incorporated into libraries and identified as part of the technical literature by people in all parts of the world.

The universal decimal classification numbers, will appear on the front cover of all standards approved by the American Standards Association and distributed through the ASA office.

TWO TENNESSEE DAMS—Standing like sentinels in the mountains are the sluiceway control towers upstream from Watauga Dam. This 320 ft. high earth fill dam, 900 ft. long and 1,275 ft. thick at the base, is nearing completion by the Tennessee Valley Authority. The picture at the right is taken from one of the abutments of the Center Hill Dam across Caney Fork River, 22 miles west of Cookeville, Tenn., under construction by the Corps of Engineers. Massman, Metcalfe and Hamilton Construction companies, Kansas City, Mo., are contractors on the 240-ft. high dam.

Dam planning and building continue

Planning and building of dams continued to dominate the news last week, especially in the West and South. On this page are pictures and brief descriptions of half a dozen, planned or building, which eventually will cost a total of more than $75,000,000, produce much needed power, and irrigate many thousand acres of land.

Plans for the $2,500,000 Lexington Dam on Los Gatos Creek, near San Jose, Calif., were approved Aug. 12 by State Engineer Edward Hyatt. Construction will start after two miles of the Los Gatos-Santa Cruz highway near the dam site is rerouted at a cost of $2,450,000. Forty sq. mi. of watershed will drain into the 25,000 acre-ft. lake formed by the dam.

The Santa Clara Valley Water Conservation District is building the structure, with G. Walter Hunt, chief engineer of the district, in charge. Actual work is not expected to begin until early next year. Rerouting of the highway will require a year, and construction on the dam another year, with operation of the structure planned for about the end of 1950.

Oppose Idaho dam

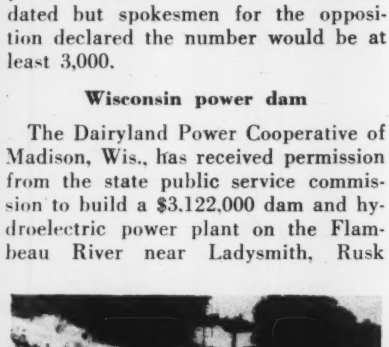
Construction of the proposed Kooskia Dam on the Clearwater River near Greer, Ida., met strong opposition from three Idaho communities at a public hearing conducted at Kamiah by Col. O. E. Walsh, Portland, Ore., District Engineer. The three communities—Kamiah, Kooskia and Stites—would be flooded by the proposed reservoir, as would two other settlements, 4,000 acres of farmland, 3,000 acres of timber and 16,000 acres of grazing land, opponents testified.

Colonel Walsh said the dam would provide 440,000 kw. of electrical energy. Army figures, based on the 1940 census, showed only slightly more than 1,000 persons whose homes would be inundated but spokesmen for the opposition declared the number would be at least 3,000.

Wisconsin power dam

The Dairyland Power Cooperative of Madison, Wis., has received permission from the state public service commission to build a $3,122,000 dam and hydroelectric power plant on the Flambeau River near Ladysmith, Rusk County, Wis. The average annual output of power will be 50,000,000 kwh., according to estimates presented with the cooperative's request for authority to build.

E. R. Crocker, engineer of the Bureau of Reclamation and tunnel designer, will head the $35,000,000 Santa Barbara County, Calif., project which will include construction of Cachuna Dam and a 210,000-acre-ft. capacity reservoir for the waters of the Santa Ynez River. The reservoir, with its connecting tunnel and conduit, will supply water for the city of Santa Barbara and irrigate some 30,000 acres of farm land.



SEVEN-MILE belt conveyor system from quarry to damsite solves a material handling problem at the site of the $47,000,000 Bull Shoals Dam in Arkansas.

Bureaus repaid in part for June flood damage

Recent allocations totaling $2,000,000 by the Department of the Interior to its bureaus reimburse them in part for the costs of assisting localities during the Columbia River flood in June and of repairing extensive flood damage to their own installations. The Second Deficiency Appropriation Act of 1948, passed by Congress in June, gave the department the necessary money for this purpose (*ENR* July 1, p. 2).

Estimates made after the flood had subsided show that a total of $7,671,734 is needed to cover a complete job of repair.

While the flood was still raging, Assistant Secretary of Interior C. Girard Davidson testified before the Senate, upon his return from the Northwest, that preliminary estimates indicated the damage would exceed $3,000,000 and that the $2,000,000 emergency fund would provide the department with a minimum of funds required to meet most pressing needs.

OBITUARY

Earl B. Lovell, 79, civil engineer and former professor at Columbia University, died at Marathon, N. Y., Aug. 23. He had retired in 1934 after having been chairman of the university's department of civil engineering for 18 years. He received his C. E. degree from Cornell in 1891 and went to work as an assistant engineer on the Michigan Central Railroad. He joined the staff of Lafayette College in 1893 as instructor in civil engineering and taught at Cornell from 1896 to 1898. In 1933 he organized and became president of Earl B. Lovell, Inc., engineering and surveying firm.

Charles G. Chaffey, 32 of Marion Station, Md., a civil engineer for the Navy Department in Washington, D. C., was drowned on Aug. 20 when a fishing boat fire forced him to jump overboard. He was a veteran of 32 combat missions with 8th Bomber Squadron and a captain in the U. S. Air Corps Reserve.

Edward L. Rawson, 83, engineer and formerly construction superintendent on large projects in Boston, Mass., died Aug. 19 in Newton, Mass. He was a graduate of Massachusetts Institute of Technology. He worked on the building of Long and Tudor wharves, Boston Harbor, and on the construction of many sea walls, wharf foundations, and industrial buildings.

Farrar P. Hamilton, civil engineer, died in New Orleans, La., Aug. 15. He was a graduate of Washington and Lee University and at one time was assistant city engineer of Jackson, Miss. He had been president of the Louisiana division of the ASCE and of the Louisiana Society of Civil Engineer.

Francis W. Mahony, 65, consulting engineer, died in Dorchester, Mass., Aug. 20. A graduate of Amherst College, Mr. Mahony was associated for many years with LeClear & Robbins, engineers and architects, Boston, and later conducted a consulting practice under the name of Mahony & Webb.

John Milton Allison, 41, chief of town management at McNary Dam, died at Pendleton, Ore., Aug. 19. Before his transfer to McNary Dam operations he was head of the hydrology section of Portland district, Corps of Engineers.

Gilbert L. Wilcox, civil engineer, and former city manager of Dover, Del., died in Philadelphia, Pa., Aug. 15. He was a graduate of the University of Pennsylvania.

Charles C. Sharah, 74, retired construction engineer, died in Washington, D. C., Aug. 21. He had been employed by the Westinghouse Co. and by the federal government.

Bertus P. Larkin, 67, vice-president, director and eastern manager of the S. J. Grove and Sons Co., construction engineers of Minneapolis, Minn., died Aug. 28 in N. Y. City. He was the builder of many heavy construction projects in the U. S. and South America, and supervised the enlargement of Newark Airport during the war.

Christopher M. Sturgis, 74, a graduate in civil engineering, University of Kansas in 1898, died Aug. 20. He was a member of the civil engineering staff, Kansas City, Kan., until 1939, when he became associated with the Hughes Airport, Los Angeles.

Godfrey H. Schmidt, 55, civil engineer with the city of Columbus, Ohio, for 30 years, who retired July 15, died Aug. 19. He joined the city engineering department in 1918.

Robert N. Warnock, 40, engineer and president of Charles Warnock & Co. Ltd., Montreal, died Aug. 24. He was a graduate of the Royal Military College, Kingston, Ont., and of McGill University, Montreal.

Robert L. Schmid, 62, chief engineer for the Nashville, Chattanooga & St. Louis R. R., died at Nashville, Aug. 21. Mr. Schmid had been with the N. C. & St. L., since 1915, and prior to that was with the Louisville & Nashville. He attended the University of Kentucky. After leaving Louisville he became assistant division engineer at Chattanooga, then division engineer at Atlanta; and later assistant to the general manager, also at Atlanta. He became chief engineer eight years ago.

Denn M. Burgess, 57, former executive vice-president and manager of R. G. LeTourneau, Inc., died at Lafayette, Calif., Aug. 22. He started with LeTourneau at Peoria, Ill., in 1931 as a district representative and Eastern sales manager and became general manager in 1938. The next year he was made a vice-president. He retired in February, 1946, when he went to California to live.

CONSTRUCTION ACTIVITY

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of Sept. 2 1948	Cumulative 1948 (36 wks.)	Cumulative 1947 (36 wks.)
Federal	$6,778	$686,387	$456,683
State & Mun.	74,557	1,790,948	1,168,880
Total Public.	$81,335	$2,477,335	$1,625,563
Total Private	65,466	2,276,846	2,108,800
U. S. Total..	**$146,801**	**$4,754,181**	**$3,734,363**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

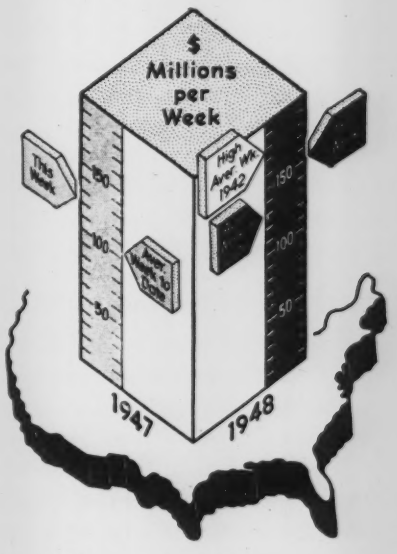
Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1948 (36 wks.)	Cumulative 1947 (36 wks.)
Waterworks ...	10,203	141,815	67,700
Sewerage	4,202	157,642	80,566
Bridges	2,459	200,311	106,279
Highways	17,020	716,422	495,341
Earthwork, Waterways	5,861	356,771	194,127
Buildings, Public	36,038	750,559	351,196
Industrial ...	23,260	673,238	495,147
Commercial .	33,011	1,295,822	1,082,062
Unclassified ...	14,747	461,601	435,453

NOTE: Minimum size projects included are: Waterworks and waterway projects, $28,000; other public works, $50,000; industrial buildings, $68,000; other buildings, $250,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1948 (36 wks.)	Cumulative 1947 (36 wks.)
NON-FEDERAL ...	Current	$1,577,102
Corporate Securities	Figures	544,507
State and Municipal	Not	784,884
U. N. Building Loan	65,000	.....
FEDERAL	1,558,932	818,729
Fed. Aid Highway.	427,289	247,711
	Available	
Total Capital	.....	**$2,395,831**



As Reported this week to ...
Engineering News-Record

ENR INDEX NUMBERS

Index Base = 100	1913	1926
Construction Cost..Aug. '48	475.51	228.58
Building Cost .....Aug. '48	355.45	192.15
Volume .....Aug. '48	254	111

EDITORIALS

VOLUME 141 NUMBER 10

September 2, 1948

Steel Allocation

THE ACTION OF THE STEEL INDUSTRY in working through the machinery it has set up in cooperation with the Department of Commerce to allocate, voluntarily, 59,000 tons of sheet and strip steel to prefabricated housing manufacturers deserves commendation. Most importantly, it shows that the industry can police itself, and make difficult decisions affecting its own customers. It was not easy in this case to deny the claims of such a big buyer of steel as the auto industry. It took even more courage to give the steel to what might be termed an experimental industry. Yet from the national viewpoint, the action taken was undoubtedly sound. Housing is badly needed. Building labor is scarce, and prefabrication theoretically can save on manual and site operation. Prefabrication, too, is just getting a toehold, and in view of its potentialities, deserves a helping hand. Finally, high building costs need to be attacked at every opportunity, and prefabricators claim they have one answer. By their allocation decision, the steel manufacturers helped the prefabricators out of a temporary difficulty. They gave aid in the fight to reduce housing shortages and high costs. And they may have provided themselves with some future comfort should the prefabricated house prove such a success that its steel requirements become large and permanent.

Recruits for the Railways

COMMENT in these pages in the Aug. 19 issue on what the Virginia Department of Highways is doing to get boys in high school interested in highway work as a career brings from S. R. Hursh, assistant chief engineer of the Pennsylvania Railroad, a copy of a booklet entitled "Railroad Engineering: A Challenge and an Opportunity". Copiously illustrated in color, it is addressed to engineering students in college, giving them the details of the five training courses given by the Pennsylvania each year to a limited number of graduate engineers. For nearly 50 years the Pennsylvania Railroad has employed this method for obtaining potential executives. The course now covers 36 months of prescribed practical training. That it has paid dividends is made evident by a statement in the pamphlet that of the company's eleven presidents, seven in succession have been engineers. Currently four vice presidents and three regional general managers are engineers, and virtually all general superintendents and superintendents as well as some of the higher officers began their careers under this junior engineer program. In these days when much of the pioneer glamour is gone from railroad engineering there is great need for this type of recruiting because, as is stated in a footnote to two letters on p. 95 of this issue, it no longer is obvious to the young engineer that railroading still provides opportunities for the exercise of initiative. The opportunities are there, but a better selling job needs to be done if the right type of young men are attracted to railroad engineering.

No Letup in Housing

DESPITE problems of high cost, scarce materials and shortage of labor, the housing boom continues unabated. More convincing proof of the nation's need for housing is not to be found. Studies and statistics have repeatedly been made and marshalled to indicate a requirement of a million dwelling units a year for ten years, and now we are on the road to approaching that goal for one year at least. In four different months, housing "starts" have exceeded 90,000, and the average for seven months is close to 80,000. How to maintain this pace becomes the problem of the moment. The solution is not crystal clear—it can never be on an activity so vast and varied—but there are encouraging signs. Labor is becoming more efficient just by practice, if nothing else. Contractors, new to the housing business (and there are many), are learning how to schedule and run jobs better. Material shortages are not so common, even though there is still room for improvement. These signs are easily recognized. One that is not so plain, but maybe even more potent, is the growth in inventories of consumer goods whose often necessary purchase at high prices has cut down the amount of salary or savings available for housing. If these higher inventories should presage a reduction in prices the chances for continued high housing construction would be greatly improved. The ultimate hope would be that housing costs themselves would come down, but just to have the threat of higher general living costs dissipated would be a powerful stimulant. Such lowering of

living costs is only a spot on the horizon now, but it will bear watching.

Warning on Estimating

WHEN contractors give a buyer an estimate for a job, which may in effect become the basis of an oral agreement to do the work, they should at least be aware of what happened recently in Montesano, Washington. There, the judge in a state superior court ruled that a contractor who had estimated the cost of installing a home hot air heating system at "about $500", was entitled to charge the buyer no more than 25 percent in excess of the estimate. The contractor had billed the purchaser nearly 100 percent in excess.

The judge pointed out in his decision that the contractor had forty years' experience in business, and that the purchaser, therefore, was justified in assuming that he was familiar with costs. In these days of rising costs and uncertain material deliveries, the basis for such an assumption is rather shaky. Estimates carefully and conscientiously made too frequently have proved inadequate. And the consequent higher cost of a job is as much regretted by contractors as by owners. Indeed, nothing in the decision indicates that any evidence was produced to show that the contractor in this particular case deliberately underestimated the cost of the job.

What the judge apparently sought was to sound a warning against careless and unprincipled estimating, for he wrote, in answer to an inquiry from *Engineering News-Record*, that "The Court realizes fully that the decision is probably without precedent, but believes it to be very wholesome as tending to minimize or entirely eradicate a growing practice among contractors of making an estimate of work or labor with no thought of being held to it by assuming that they may double, triple or even quadruple the amount on a bill of labor and material."

That the judge followed the law in thus attempting a moral or social reform may properly be questioned, although it cannot be answered since the verdict was accepted and not appealed. But the fact that he thought owners need some protection against unrealistic or deliberately-low estimates is significant.

One moral from the case is that off-the-cuff estimating and horseback opinions on costs are dangerous tools to use in the construction business. Perhaps another is that written contracts are wise for even the smallest job.

Exit to Jurisdictional Strikes

BOTH LABOR AND MANAGEMENT should take great satisfaction in one statement made in the interim report of the joint House-Senate committee that was set up to do "watch-dog" duty on the Taft-Hartley labor law. Jurisdictional strikes have all but vanished, the committee says.

Of all the costly accoutrements of union labor development, the jurisdictional strike was the most disheartening. Many a contractor, through no fault of his own and with no concessions available to him that would effect a settlement, has had to take substantial losses because a plumber wanted to drive a nail or a carpenter insisted on tightening a nut. Responsible leaders of labor itself did not like the jurisdictional strikes, and frequently cooperated in setting up boards or panels to settle differences, but in too many cases agreement to set up such boards was not reached until a strike had done its damage.

With the passage of the Taft-Hartley Act outlawing the jurisdictional strike, however, a great improvement was possible. Disputes could be settled while work continued, and decisions once taken were more apt to stick.

It is greatly to the credit of AFL union leaders and the governing board of the Associated General Contractors that quick advantage was taken of this situation by setting up machinery for the organization of joint boards for the settlement of jurisdictional disputes. As reported last week, the first two decisions have just been handed down by unanimous vote of boards upon which both unions and contractors were represented. These decisions are now applicable on a national basis to all similar disputes. As other decisions come along, they will be added to the list, thus building a body of agreement around which many disputes can be settled without recourse to the joint board machinery. But as new disputes arise, as when new materials are introduced into construction, the machinery is there to dispose of them.

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WALDO G. BOWMAN, *Editor* EDWARD J. CLEARY, *Executive Editor* E. E. HALMOS JR., *Managing Editor*
New York: V. T. BOUGHTON, R. H. DODDS, T. D. MacGREGOR, F. S. MERRITT, JOHN C. BUMSTEAD and ARTHUR J. FOX JR., *Chicago:* H. T. PEREZ, *Cleveland:* J. R. CARR *Washington:* V. B. SMITH *San Francisco:* N. A. BOWERS, L. L. WISE
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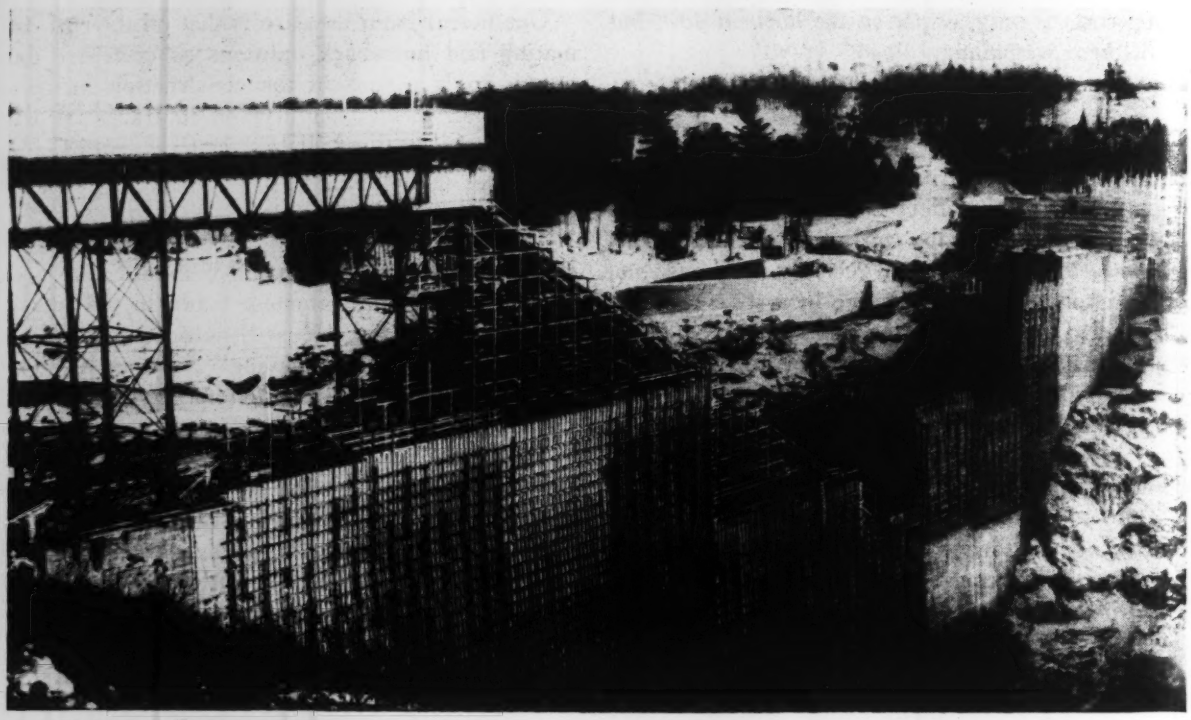


PLACING OF CONCRETE in Stewartville Dam was continued through the severe Northern Ontario winter.

Ontario Hydro Pushes Work On Power Dam at Stewartville

PLACING OF CONCRETE in Stewartville Dam in eastern Ontario was carried forward actively during the winter months in an effort to have the project producing much-needed power by September, 1948.

The Stewartville project is located on the Madawaska River, a large tributary of the Ottawa River, about 50 miles west of the city of Ottawa. It is being built by the Construction Department of The Hydro-Electric Power Commission of Ontario as one of its first postwar undertakings in a program for the additional power supply in Southern Ontario. A power plant farther up the Madawaska River at Barrett Chute was completed during the war.

Stewartville Dam is of the non-overflow gravity type, 1,300 ft. long at the crest and 206 ft. high at the deepest point, making it the highest dam yet to be built by the Hydro Commission. Headworks serving three 14-ft. steel penstocks are being installed in the northerly part of the main dam, and sluiceways for the discharge of floodwaters are located near the southern end. Two of these are 35 ft. wide and equipped with sluice gates operated from the crest of the dam, and two are 14 ft. wide, closed with stop-logs. Below the sluiceways is a concrete lined spillway channel between high concrete training walls which will carry floodwaters over the rocky slope to discharge into the open cut at the outlet of the rock tunnel driven for river-diversion purposes. Concrete baffles have been built across the lower end of that cut to act as diffusers, thus preventing erosion of the river bank below the outlet.

The powerhouse is located immediately below the main dam at the northerly side of the river channel. Three penstocks descend to it down the sloping face of the dam, being supported on steps formed on the downstream face of the dam during construction. They are to be encased in concrete envelopes having a minimum thickness of 18 in. as a protective measure and to prevent expansion and contraction of the penstock due to large variations in temperature.

Three single-runner vertical-shaft Francis-type turbines, with internal revolving field generators, are to be installed in the power house. Each unit will generate 27,000 hp., or a total of 81,000 hp. for the three units when operating under a gross head of 150 ft. and discharging approximately 6,000 cfs. through the plant.

Started in 1945

Construction of the project began in the fall of 1945, the first work being driving of the horseshoe-type diversion tunnel through the south bank. This tunnel is 30 ft. wide, 30

ft. high, and 520 ft. long, and has ample capacity to handle spring flows in the river. The flow during the spring of 1947 reached a peak of 18,000 cfs.

After the tunnel had been driven, a concrete control structure was built at the upstream end. Steel gates are to be dropped into the two openings in this structure when the time comes to begin storage of water in the reservoir, and a large concrete plug will be formed in the upper end of the tunnel by pouring concrete down through two 10-in. well-drill holes sunk from the surface.

Building of the two river cofferdams also was begun in the fall of 1945 and excavation within the cofferdams got under way during the winter of 1945-46.

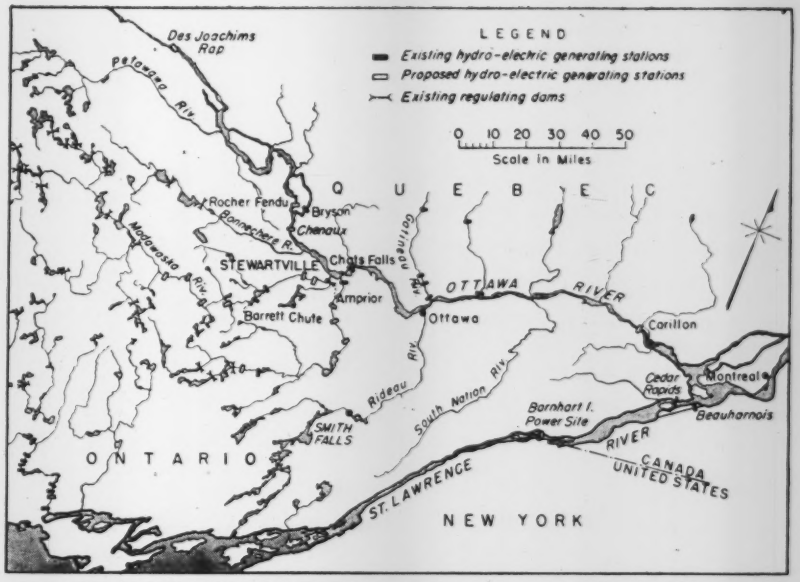
Obstacles to progress

As originally planned, it was hoped to have the power plant in operation early in 1948, but a continuing scarcity of labor and delays due to unforeseen conditions in the river bed have set the program back and have required some readjustment of the proposed method of construction.

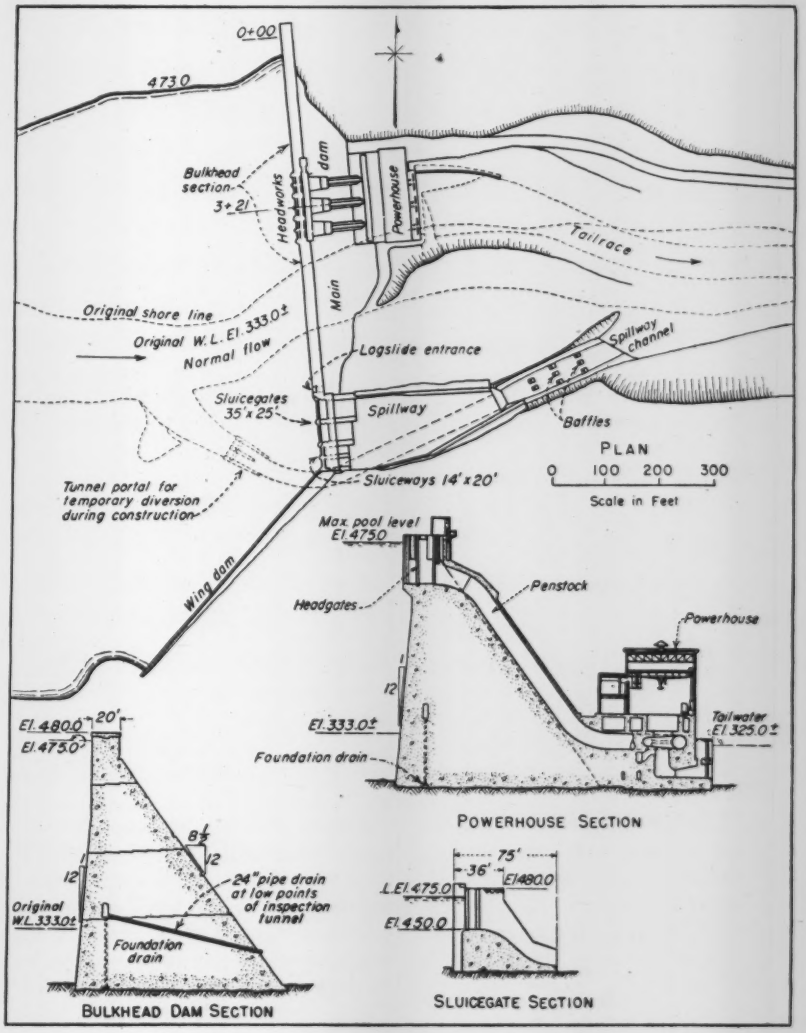
The Madawaska River at this development flows along the deeply eroded channel of a pre-glacial river. The course of this pre-glacial river was influenced by a major fault zone cutting through the crystalline limestone formation underlying the whole site, which was later filled with glacial debris. The present river has eroded to within 40 ft. of the old river bed. Although considerable diamond drilling was carried out, when this glacial debris was removed it was evident that the excavation would be considerably greater than originally estimated due to disintegrated limestone pockets.

The resulting delay in obtaining a sound foundation for the dam in the river bed made necessary a change in the concreting program.

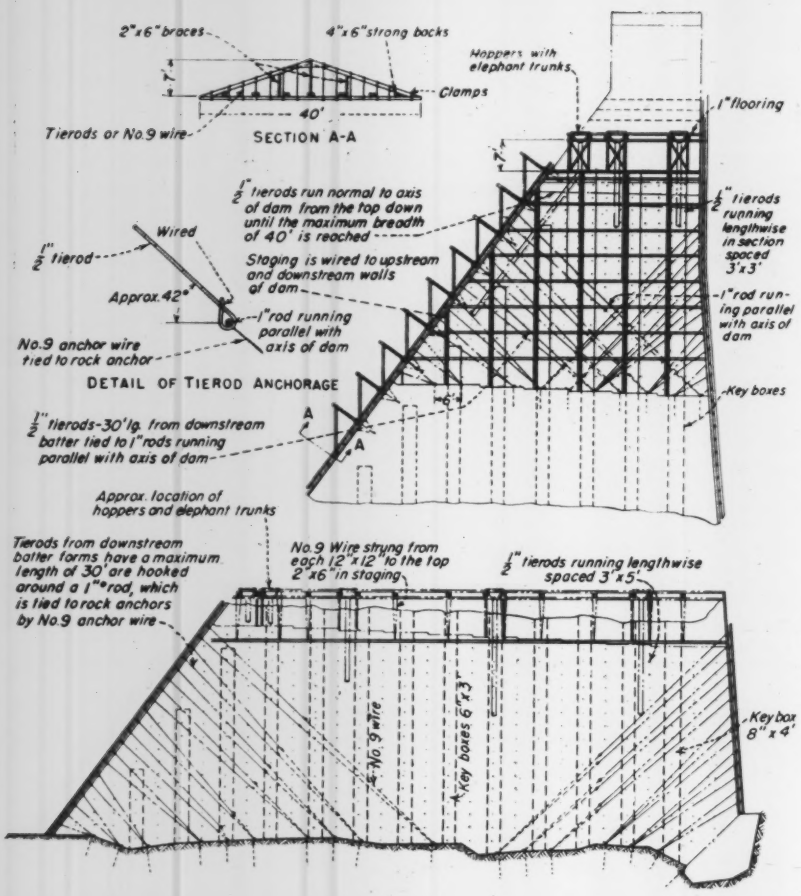
The Ontario Hydro has had excellent results from placing concrete in high lifts. Heat of hydration of ce-



THE STEWARTVILLE PROJECT is part of a program for developing Ontario's share of the power resources of the Ottawa River valley.



PLAN AND TYPICAL CROSS-SECTIONS of the Stewartville Dam. During construction, the Madawaska River is being diverted by a tunnel through the south abutment which discharges into the lower end of the future spillway channel.


2"x6" braces
4"x6" strong backs
Hoppers with elephant trunks
Clamps
1" flooring
40'
Tierods or No.9 wire
SECTION A-A
1/2" tierods run normal to axis of dam from the top down until the maximum breadth of 40' is reached
1/2" tierods running lengthwise in section spaced 3'x3'
Wired
1" tierod
Staging is wired to upstream and downstream walls of dam
Approx. 42°
1"rod running parallel with axis of dam
No.9 anchor wire tied to rock anchor
DETAIL OF TIEROD ANCHORAGE
Key boxes
1/2" tierods-30' lg. from downstream batter tied to 1" rods running parallel with axis of dam
A
Approx. location of hoppers and elephant trunks
Tierods from downstream batter forms have a maximum length of 30' are hooked around a 1"ø rod, which is tied to rock anchors by No.9 anchor wire
No.9 Wire strung from each 12"x12" to the top 2"x6" in staging
1/2" tierods running lengthwise spaced 3'x5'
No.9 wire
Key boxes 6"x3"
Key box 8"x4'

FORMS FOR THE 50-FT. HIGH LIFTS did not need to be unusually strong because of the slow rate of rise of the concrete.

ment seems never to have been a problem on their work, while horizontal joints have given trouble in the past. Consequently, and the exact opposite of usual practice in the United States, they pour in the highest lift that it is at all practical to form—at Stewartville—in the neighborhood of 50 ft. Thus, the necessity for water stops and for cleaning for bond with a new lift, as well as the frequent bad joints on the downstream face, are very substantially reduced.

The method of placing concrete was influenced considerably by this decision of the engineering department to keep construction joints to a minimum. The high lifts required a large number of form rods and bracing that made placing by crane or cableway bucket impractical. Plans for extensive concreting throughout the winter months, with temperatures ranging to 40 deg. below zero, required protecting the form.

The plan adopted for placing concrete was to mix it in a plant on the north bank above the level of the top of the dam and carry the concrete out over the dam on conveyors for distribution by chutes and "elephant trunks". Two setups of a double-deck conveyor bridge were planned, one at about 130 ft. above the foundation and the other some 90 ft. higher. The lower conveyor bridge was to be supported on steel towers to rock, in alternate blocks of the concrete. Travelling trippers on the belt were to take the concrete off wherever desired along the belt and chute it to elephant trunks through which it would drop as much as 100 ft.

Chutes were to be supported directly from the conveyor bridge on a 2-ton capacity crane built into a gantry travelling on the top chord of the conveyor truss. Cables 1⅛ or 1¼ in. diameter across the gorge were to be used to support the elephant trunks. These were simple cableways with manually-moved carriages to spot the trunks for concrete placing.

As concrete advanced to mid-height, the towers were to be raised and set near the upstream face on the higher levels and the conveyor bridge moved to them. Concrete would again be taken off the belts by trippers and dropped as much as 100 ft. through elephant-trunk spouts.

Because of the deep excavation required for blocks in the central section of the dam and the subsequent delay to construction, it was not possible to carry the trestle across the valley according to schedule. Under a modified plan, concrete for part of the river section and north end of the dam was carried from the mixing plant on belt conveyors supported on a steel trestle and from there the concrete was lowered to the various locations by inclined chutes and elephant trunks.

Concrete for the remaining portion of the river section and structures on the south bank was trucked from the main mixing plant across the river and there pumped into the forms by concrete pumps.

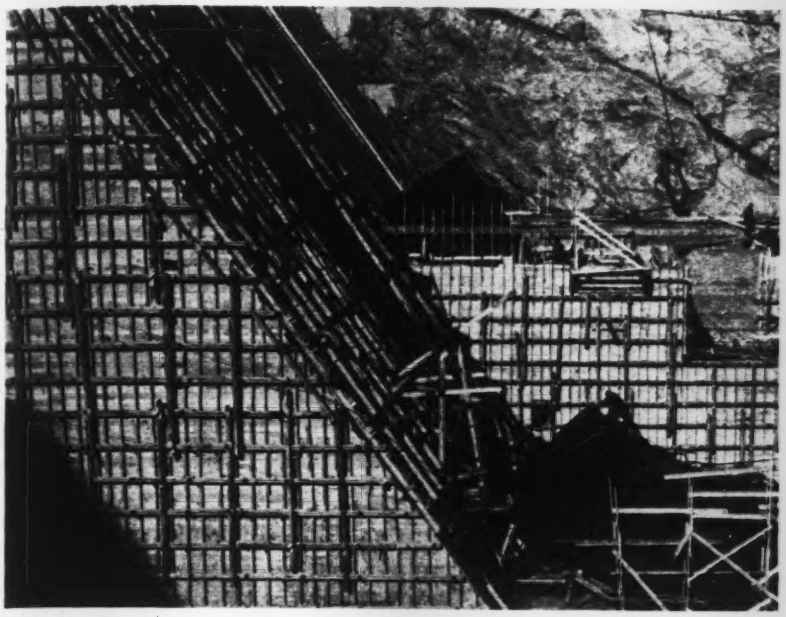
The plans for placing the major portion of the concrete were modified by eliminating the low-level location of the trestle and going immediately to the high position, where the conveyor is extended in sections as rapidly as the blocks are built part way up.

This plan requires considerably more chuting of concrete than originally was intended, but seems to be entirely satisfactory for the mixes used. No segregation is apparent and there is little water gain despite the long chutes and high lifts. Concrete was chuted as much as 140 ft. vertically on a 1 to 1 slope and then dropped 50 ft. in elephant trunks, apparently without damage.

Vertical construction joints in the dam are spaced 40 ft. apart along the axis and, since the blocks are as much as 150 ft. wide at the bottom, some of the pours have contained as much as 12,000 cu. yd.

Forms carefully braced

Forms for the 50-ft. high lifts could be light, as the concrete never rises more than one foot per hour until it is very near the top where the forms are specially tied (see Fig.) Sheathing is 1-in. square-edge lumber



TRUSSES were used to stiffen the sloping forms for the down-stream face, and these forms were held in place by tierods.

or ¾-in. plywood sheets, 2 x 6-in. stringers at 16 in. c. to c. and double 2 x 6-in. walers at 3 ft. c. to c. Horizontal tie rods are ½-in. diameter, mild steel rods at about 3 ft. centers each way. Tie rods, ½-in. in diameter, at about 42 deg. to the horizontal are securely tied to rock anchors in solid rock or previous pour. Vertical strongbacks of 6 x 8-in. timber are attached to the outside of the walers to stiffen and align the form, and standard form clamps are used.

The sloping downstream form is held by rods tied to the previous pour and kept from sagging by trussed timbers over the outside. Diagonal rods also hold the upstream form. For the top of the high forms, the diagonal rods do not extend to the bottom but are tied at mid-height to a horizontal rod that serves as an auxiliary anchor. The concrete rises slowly enough that the anchor is firmly held by the time strain comes on the rods. Inside-threaded sleeve bolts provide adjustment to align the form as the concrete rises. The top of the 50-foot high form is decked over for protection from the weather and from falling material.

For winter concreting, sufficient 1,000-E.D.R. unit heaters are hung in the forms to bring the temperature above 32 deg. F. The deck is supported on large timbers that span the 40-ft. width.

To provide work platforms in the high lift, a timber frame is hung from the deck-support timbers. This is made up of standard 8-ft. pieces, bolted together so that the entire frame can be removed a piece at a time as concrete rises. The frame serves as scaffold for building the forms and supports the long tie rods to prevent them from sagging.

Waterstops and drains

Waterstops are placed in both the vertical and horizontal construction joints, about 8 ft. back from the upstream face. They consist of ½ in. steel plates 16 inches wide set in the center of key boxes. Half the width of the plate is embedded in the first block of concrete poured. After the forms have been stripped and before the adjacent pour has been started, the entire vertical face of the first pour and the exposed half of the vertical stop are treated with a fairly heavy coat of mastic, to allow for movement of the concrete when expansion or contraction occurs.

Back of these waterstops are semicircular drains, both horizontal and vertical, all connected to the main drain in the lower part of the dam. Details of the waterstops and drains are given in the Fig., next page.

Included in the construction schedule is an extensive program of foundation grouting.

Concreting Plant

The concrete plant is designed for an output of 120 cu. yd. per hour. Circular in layout, three 2-yd. tilting type mixers are set at three of the quarter points around the circle so that each can discharge into a central hopper feeding either to the belt conveyor system or to trucks for delivery to the concrete pumps. A fourth mixer can be installed if required.

Above the mixer is an automatic charging plant where the concrete mixes are controlled.

Two grades of concrete were specified originally for the dam, a lean mix for the central part and a richer mix that is used to a depth of about 10 ft. in from the faces of the main dam and for structural details in the dam and power house. Actually, three mixes are being used, the third being a modification of the rich mix, which is used for all concrete that is to be pumped. The mixes are given in the accompanying table.

About 280,000 cu. yd. of concrete will be required for the main dam, power house, spillway and a wing dam on the south bank.

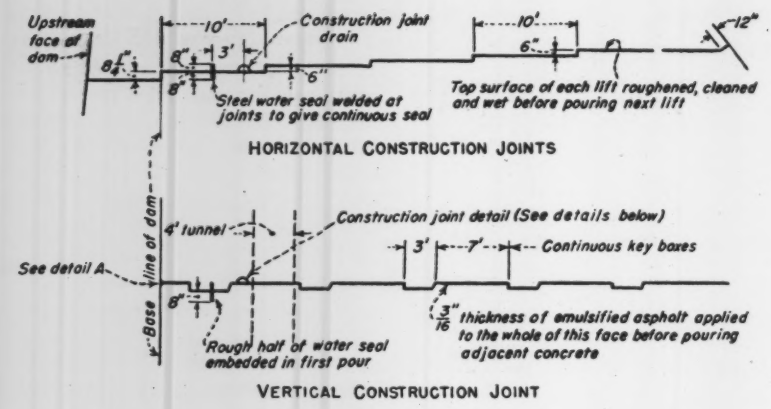
Sand and gravel was trucked to the job from a pit about 6 miles away where the sand was separated from the gravel in a stationary crusher and screening plant. Both sand and gravel are of good quality, glacial in origin, chiefly granite.

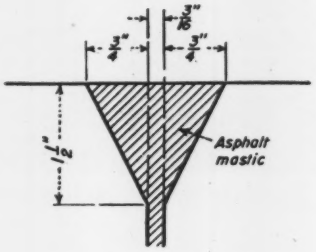
Because the gravel pit could not be worked throughout the winter, large stockpiles were built up during the summer and fall months.

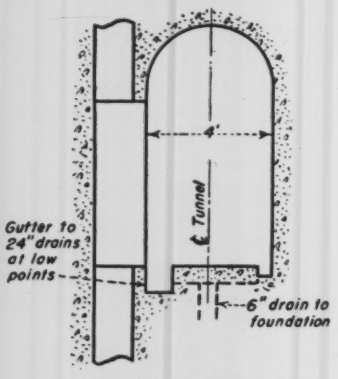
Material in the pit was hauled by

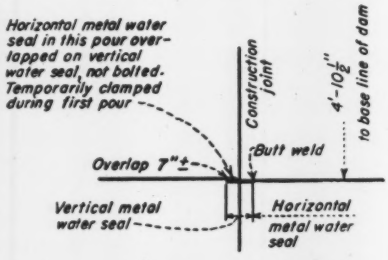
CONCRETE PROPORTIONS FOR TWO-CUBIC-YARD BATCHES

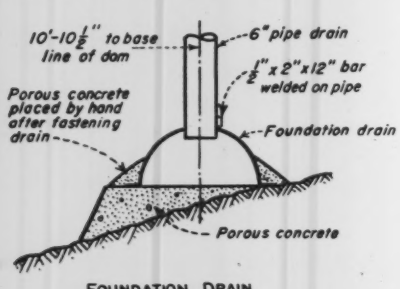
	Rich Mix (pounds)	Lean Mix (pounds)	Pumped Mix (pounds)
Cement	924	664	924
Water	574 (total)	580 (total)	574 (total)
Sand	2,780 (dry)	2,930 (dry)	2,780 (dry)
Stone, coarse	2,000 (dry)	2,000 (dry)	
medium	1,100 (dry)	1,100 (dry)	2,000 (dry)
fine	940 (dry)	940 (dry)	2,000 (dry)

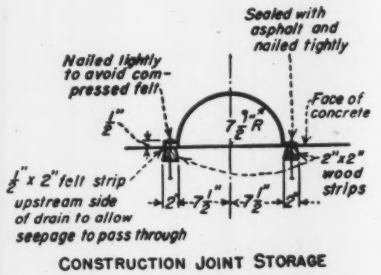

Upstream face of dam
10'
Construction joint drain
10'
12"
6"
3'
6"
Steel water seal welded at joints to give continuous seal
Top surface of each lift roughened, cleaned and wet before pouring next lift
HORIZONTAL CONSTRUCTION JOINTS
Base line of dam
4' tunnel
Construction joint detail (See details below)
See detail A
3'
7'
Continuous key boxes
6"
3/16" thickness of emulsified asphalt applied to the whole of this face before pouring adjacent concrete
Rough half of water seal embedded in first pour
VERTICAL CONSTRUCTION JOINT






Horizontal metal water seal in this pour overlapped on vertical water seal, not bolted. Temporarily clamped during first pour
Construction joint
4'-10 1/2" to base line of dam
Butt weld
Overlap 7"±
Vertical metal water seal
Horizontal metal water seal
METAL WATER SEAL CONNECTION


10'-10 1/2" to base line of dam
6" pipe drain
1/2" x 2" x 12" bar welded on pipe
Porous concrete placed by hand after fastening drain
Foundation drain
Porous concrete
FOUNDATION DRAIN



STEEL PLATES are used as waterstops in the vertical and horizontal construction joints, with drains back of them connected to the main drainage system.

carrying scrapers to a hopper set above the crusher. In the bottom of this hopper was an electrically-vibrated grizzly that separated sand and gravel under 3-in. size, permitting it to fall directly to a belt conveyor. All gravel over the 3-in. size went to the crusher. At the pit the material was screened to sand, fine and medium stone together, and coarse stone.

At the job, the big bottom dump trucks of about 20 ton pay load that hauled sand and gravel from the pit dumped over hoppers feeding belts that climbed on a steep grade to screens where the sand and the smaller stone were further segregated into coarse and fine grades and redistributed by belt into four stockpiles. Beneath these piles is a reclaiming tunnel with a belt conveyor that moves the aggregate to hoppers over the weighing batchers in the mixing plant.

Cement comes to a nearby railway siding in bulk and is hauled in bulk containers to the job where it is unloaded into a hopper from which it is moved by a screw conveyor to a bucket elevator feeding to either a storage tank over the mixers or to a storage tank close to the mixing plant. The combined capacity of these tanks is 1,750 bbl. of cement.

Winter concreting

Concrete was placed throughout the winter months. Aggregates were heated by steam lines running through the reclaiming tunnel, and water was pre-heated in the main storage tank and then, if necessary, its temperature was raised further by a steam jet in the measuring tank in the mixing plant, the object being to maintain a temperature somewhat under 80 deg.

To reduce heat lost between this plant and the points of delivery, the conveyor lines over the dam were housed and the housing heated by unit blower-type steam heaters. This housing also eliminated trouble with ice and snow on the conveyor belts.

Normally, the construction crews work two 10-hour shifts, five days a week. When concrete is being placed, the crews work "around the clock" until a pour is completed.

The project is expected to cost approximately $12,000,000 and, with the necessary transmission line to connect it with the hydro system, the total cost will be about $15,500,000.

The Stewartville project was designed and is being built under the general supervision of R. L. Hearn, general manager and chief engineer of the Ontario Hydro-Electric Power Commission; O. Holden, assistant general manager and A. H. Frampton, deputy assistant general manager, engineering; J. R. Montague, director of engineering. Construction of the dam is under the direction of D. Forgan, director of construction, and G. Mitchell, generation construction engineer, with W. B. Crombie as project manager at Stewartville, A. A. Richardson, construction superintendent, and Norman Mallock, resident engineer.

Let's Reform Land-Surveying Practice

Frank C. Bond
Licensed Land Surveyor
Greenwich, Conn.

LAND SURVEYING as an independent profession has deteriorated into a part-time or "week-end" practice as a result of which irresponsible surveys and poor property maps are being produced. The public interest requires that engineers as well as public officials consider and support ways and means for improving the economic and technical status of this important group of engineering technicians.

In an era when most professionals have boosted themselves into comparative economic security and esteem, the land-surveyor group seems to have made no progress. In fact, it seems to have slipped backward. Capable young engineers are not entering this field. Construction and allied lines of endeavor offer greater remuneration and personal satisfaction.

Most states attempt to control and improve the practice of land surveying through laws that fix educational and experience standards to be met before licenses are granted. Requirements for surveyor registration are, however, subordinate to those for professional-engineer qualification. A single examining board usually administers the law for both the PE and LS classifications. Unfortunately the LS group is too often considered as a "poor relative"—a necessary evil requiring just as little attention as possible.

Practice is not regulated

Of greater importance is the fact that state responsibility for and control over the practice of land surveying ceases with the granting of the license. Responsible members of the engineering fraternity express little or no concern over this laxity and the poor practice that often results from it. State and national societies seem to be preoccupied with and dominated by engineering viewpoints almost to the exclusion of land-surveying interests.

Except in metropolitan areas with their high land values, the practice of land-surveying also has shown little progress in decades. A lack of legal and engineering standards for deed investigation field surveys and record maps is one cause of this condition.

In many areas much of the land surveying is done by municipal or state employees, working evenings or weekends, quite often using publicly-owned equipment. Fees for such surveys provide income in addition to that obtained from another occupation. Consequently the charges are low, much lower than a full-time surveyor—using his own instruments and deriving his entire livelihood from the one source—can afford to ask. Due to such competition, no equitable fee structure based on high quality work can be established or maintained.

The Connecticut Society of Civil Engineers recently sent a questionnaire to its land-surveying members, in an attempt to secure data upon which to establish an equitable fee structure. Several case jobs were outlined, and recipients were asked to quote prices for the work described. The widely divergent results were worthless as a basis for fee-setting. However, the poll disclosed and emphasized the need for standardization in making land-surveys.

In the eastern states many more hours are often required to study and interpret land records than to complete the field survey. Yet how can public employees make this essential investigation when town and county clerks' offices are closed evenings and Sundays? Land surveys made without sufficient investigation are liable to result in malpractice that not only may take years to uncover but also will be costly to correct.

Assessor maps are inaccurate

In working up deed transfers, lawyers, property owners, and even surveyors make common use of assessor's maps that are compiled for valuation purposes only. Distances scaled from blueprint reproductions of even carefully drawn original maps can be as much as 20 to 30 percent in error. Yet such practice is common.

Another deplorable legal custom is the repetition of former deed descriptions in new transfers of property. Too often these descriptions contain flagrant errors which should be corrected. Descriptions that include phrases—such as, 'bounded north by Jones, east by Smith, etc.' utterly fail to meet modern requirements.

In subdivision work, a carefully monumented field survey together with an accurately computed map represent the minimum of good practice. Yet sketches with scaled plus-and-minus distances are accepted for filing in many areas. Land developers and real estate agents naturally prefer this method, since it costs consideraly less than an accurate survey.

The public interest not recognized

The public interest in high-grade land surveys is not widely appreciated. In marking lot lines for a client, the surveyor also establishes lines of other ownerships. He fills a semi-public position as an arbiter between adjacent property owners; he is not an advocate of his employer.

If wood stakes are used to mark lot corners, they rot out in a few years, making the survey only temporarily effective. When a map is filed with the town or county clerk, a permanent record is provided. But a carelessly prepared subdivision map is likely to affect scores of ownerships adversely for an indefinite period of time. Cases are reported where the cost of re-establishing subdivision lots laid out after World War I would exceed the values of the lots.

Rapid suburban expansion in many areas today is complicating an already bad situation simply because no intelligent control is exercised over

the making of land surveys and the preparation of record maps.

There are several ways by which the quality of land surveys and maps can be improved, but different solutions will be required in various states and sections. The map on file in the public records is permanent evidence of the surveyor's work. In the public interest that map should show complete information so that in ten or twenty years another surveyor can relocate the property. All measurements and notes taken in the field should be reproduced on the map. Particularly important are corner references to physical structures, monument descriptions and depths to buried markers. The practice of deliberate omission of data from maps should be barred.

To assure the public that the surveyor takes time to investigate his job as well as the rights of adjacent landholders, simple, definite and comprehensive regulations covering property transfers could be formulated and given legal sanction.

This protection might be provided under several plans:

(1) *Creation of an office of surveyor-general in each state.* Such an officer would exercise regulatory power over the whole field of land-transfer surveys and maps. He would pass on all maps offered for public filing, issue regulations of practice and submit to the state legislature, from time to time, data that would provide a basis for improved practice. Properly administered, a surveyor-general office would not only be of considerable value to the public but also the practice of land surveying would be given a positive direction.

(2) *Control by local regulation.* Many town and city planning-boards maintain and exercise strict rules of subdivision development. The architect and sanitary engineer must submit plans to the local building inspector. Approvals must be obtained prior to construction. These professions function under codes set up years ago (Revisions are being made to meet todays' requirements). State legislation probably would be required to delegate land-survey control power to lesser units of government, and a great confusion of regulation might result.

(3) *Control by voluntary codes adopted by state engineering societies.* This plan has been tried but it is handicapped because property owners and attorneys know the legal requirements for land transfers.

(4) *Regulation of land-surveying practice through control of maps placed on public record.* This solution appears to be the most advantageous. The land-survey practice could be regulated by state law setting up minimum standards that would have to be met before the map is accepted for filing. Maryland has such a law governing subdivision work. Massachusetts has set up standards for surveys and maps to be filed with the State Land Court. In both instances, the law is simple, brief and adequate.

These precedents could easily be enlarged upon to cover regulation of all land-map preparation. Under this plan, the owner would certify on his property map that the legal requirements had been fulfilled. He would then be compelled to examine the surveyor's work critically, a procedure which should encourage better work.

Higher costs and better surveys

It is conceded that survey costs will be higher under this regulatory arrangement but the increased value of the improved surveys will far outweigh the added expense. To convince property owners that the additional cost is justified as insurance of better work will require patient education and explanation, to which the owner is entitled.

The longer the day of meeting this issue—obtaining better land surveys and maps—is postponed, the more difficult the reform will be. It is believed that the suggested controls will rejuvenate the science of good land surveying, make its practice worthwhile economically, and encourage technical improvement through proper use of up-to-date-surveying methods and instruments.

FOUR STEPS FOR MAKING LAND-TRANSFER SURVEYS

Preparation—The surveyor should have complete knowledge of all factors affecting the premises to be located or re-located. A title check (search, if necessary) immediately prior to the survey should be made by the surveyor or lawyer, to collect all legal descriptive data upon which the ownership is based. Care must be taken to recognize and resolve conflicts. Old subdivision maps should be checked as well as the records of previous surveyors.

Field Work—Surveys of city property should have an accuracy of 1 in 10,000 or better. Farm-land surveys in well-settled areas should close within 1 in 5,000 or better. Wherever economically possible, referencing connections should be made to federal and state geodetic systems, section corners, highway or other public markers and natural, permanent objects. Corner monuments of durable material should be set with accuracy and with semi-permanency. All structures should be referenced to boundary lines. Curbs and sidewalks, storm and sanitary sewers and overhangs should be located.

Mapping—To tell the ownership story graphically, the plot should show all detailed information not readily described by words. The map should be drawn to a convenient scale from adjusted transit traverses, and show boundary distances, (by measurement and by deed) and intersecting angles; area of property; buildings, projections, overhangs, easements, sidewalks and sewers; corner elevations; street names; north point; references to deeds used in survey; names of adjacent property owners, a complete title with owner's name, location of property and date; and the surveyor's seal. In general, all information taken during the survey should be included on the map.

Deed Description—The surveyor should either write or approve the description. The widely accepted phraseology for deed description is awkward, clumsy and archaic. Great improvement in descriptions can be effected by use of simple, precise English. Greatest care should be exercised to preclude future misinterpretation.

Plant Mix Cuts Retread Costs On South Carolina Roads

EXPECTING good performance at a lower construction cost, the South Carolina State Highway Department in 1947 shifted from mixed-in-place, cold-laid bituminous work to plant-mixed, hot-laid asphaltic concrete for a major share of its retread work.

A higher percentage of hot-laid mileage is planned for 1948, most of it done by contract in contrast to the former practice of doing all retread projects with state forces.

About 600 miles of retread work, including that on both the primary and secondary systems, was carried out by the South Carolina department in 1946. Except for 40 miles of plant-mixed asphaltic concrete put down with a paver while still hot, all of the mileage was road-mixed construction.

This work cost about 22 c. per sq. yd., and it followed methods developed over the last 20 years. Briefly this called for addition of about 75 lb. per sq. yd. of graded aggregate with a minimum of 0.8 gal. or RC-2 asphalt of 85 to 100 penetration. These materials were mixed on the road with long-base, multiple-blade machines designed especially for retread operations.

A much different procedure was followed in 1947. Early in the year, when bids were opened for about 800 miles of retread work calling for the cold-laid surfacing, the minimum bid for much of the mileage was 27 c. per sq. yd., considerably above estimates. As a result, most of the projects were readvertised with many of the specifications changed to call for hot-laid surfacing. In all cases the new bids for this type of resurfacing were lower than those received for the comparable cold-laid type.

This, coupled with the advantages the hot-laid procedure is considered to have over the older methods, resulted in the award in 1947 of about 300 miles of plant-mixed construction, and approximately an equal amount of road-mixed work.

Many advantages of the plant-mixed method in addition to cost savings are cited by state engineers. They include: Much less interference to traffic while the retread is being put down, less frequent and shorter delays of operations due to bad weather, and possibility of work over a much longer construction season. Normally, in South Carolina, the road-mixed surfacing is not put down before April or after Oct. 15. In contrast, the hot-laid work can be started in March and continued until December.

It is pointed out, however, that all of these advantages would not have existed a few years ago when a much lighter retread was specified. Then, only about 50 lb. per sq. yd. of aggregate was specified for retread work, in view of the lower volume of traffic of that time and lighter vehicles. Use of a paver to lay that amount of stone probably would not have been practical, but with the greater thickness of material now being put down, the paver is logical.

The hot-laid asphaltic concrete is used to resurface those highways on which the pavement consists of bituminous surface treatment on a sand-clay or topsoil base. It is also being specified for resurfacing old portland-cement pavements previously surfaced with an inverted bituminous penetration treatment. The latter treatment is considered to provide a good bond between the old pavement and future bituminous retreads.

As a first operation in construction of the hot-laid retread, a tack coat consisting of from 0.05 to 0.10 gal. per sq. yd. of cut-back asphalt is added, although in a few cases emulsified asphalt is used. The asphalt is allowed to cure at least two hours before the asphaltic concrete is added. When it has cured, the asphaltic concrete is generally added at a rate of 80 lb. per sq. yd. It consists of graded aggregate containing 6 to 7 percent by weight of 85 to 100 penetration asphalt. The materials are mixed at 250 to 350 deg. F.

The aggregate must meet the following gradation:

Sieve Size	Percent Passing	
	Minimum	*Maximum*
½ in.	100	—
⅜ in.	80	98
No. 4	50	75
No. 10	35	60
No. 40	10	35
No. 80	2	25
No. 200	0	12

To provide the desired gradation, bank run sand and crushed stone are frequently mixed in about equal proportions, and on some jobs gravel is substituted for the stone. No mineral filler is used. The asphaltic concrete is put down as a single course. General practice is to pave one lane of the highway at a time, leaving the other lane free for one-way traffic controlled by flagmen. However, if the traffic can be conveniently detoured, the lanes are sometimes paved simultaneously using two pavers kept close together. Rolling is done with an 8 to 10-ton smooth-wheel roller.

Cost 22 to 26 cents per sq. yd.

Cost of the hot-laid work in 1947 was from 22 to 26 c. per cu. yd., most of it at the lower figure. However, to obtain these prices the projects had to be so planned that the contractor was able to bid on at least 20 miles of work.

S. N. Pearman is state highway engineer for the South Carolina department, and W. K. Beckham is maintenance engineer. The state's four district engineers are in direct charge of the department's field work.

World's Concrete

L. Compagna
Consulting Engineer
Sao Paulo, Brazil

FIG. 1. HEADQUARTERS BUILDING of the Banco do Estado de Sao Paulo in Brazil dominates sky line over Antonio Prado Square in city's center. An octagonal tower, erected on top of the 34th floor, rises to a height of 507 ft. above the street.

DURING THE WAR, when concrete was the only structural material available, officials of the Banco do Estado de Sao Paulo decided to push construction of a 34-story skyscraper to house their main office. Completed in June, 1946, this building is now the world's tallest concrete structure.

The top of the octagonal tower that extends above the 34th floor is 507 ft. above the street.

In the heart of Sao Paulo, Brazil, the building extends from the intersection of Joao Bricola and 15 de Novembro Streets, at Antonio Prado Square, to Boa Vista St.

For construction purposes, it was erected in two independent sections: one, with an entrance on Boa Vista St., is 16 stories high; the second, with an entrance on the square, is the 34-story structure. The following description pertains only to the latter.

This building has a total floor area of 220,000 sq. ft. In plan, the shape is a trapezium (Fig. 3) for almost the full height, despite setbacks at the 12th, 16th, 26th and 33rd floors.

At the base, the trapezium is 148 ft. long, but only 41 ft. wide. Thus the building is exceptionally slender for its height, and special attention had to be given in the design not only to wind stresses but also to elastic stability.

The structural frame consists principally of six reinforced concrete rigid frames (Fig. 3) similar to Frames III and IV, which are shown in elevation in Fig. 4. The horizontal members of the frames are not located at every floor. In the lower part of the building, wind girders are three to four stories apart and in the upper portion generally two stories apart.

In intermediate stories, floor girders support only vertical loads. With simply supported ends, they were de-

Tallest Building

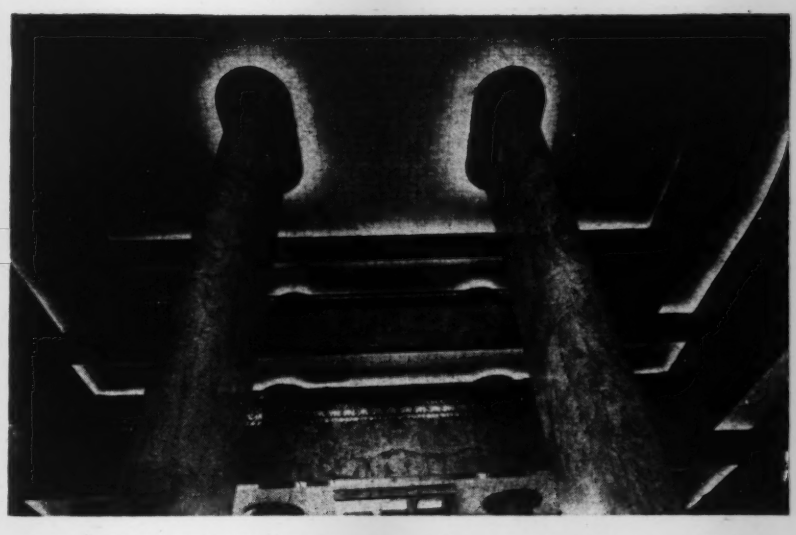


FIG. 2. THE BANK LOBBY has acoustic ceilings and fluorescent cove lighting. Walls and columns are faced with matched marble slabs.

signed not to participate in resisting horizontal forces and hence do not transmit wind moments to the columns or contribute to their deformation. Reduction of the number of wind girders simplified the analysis of the statically indeterminate framework and lowered the cost of construction.

The design of the frame members presented no special problems, but the determination of stresses at the junction of the wind girders and columns was difficult, since the usual method—valid for the analysis of straight bars—does not hold. Stress calculations for the joints were therefore based on experimental results that indicate that stress patterns at the intersection of girders and columns are similar to those of some types of heavy arches.

Design consideration was given to dynamic wind action as well as to static stresses. Calculations indicated that the period of vibration due to wind is about equal to that due to damping forces and that, therefore, there will be no risk of the building swaying and so producing high dynamic stresses.

The structure rests on a 10-ft. thick concrete mat carried on 20-in. dia. cast-in-place concrete piles. The piles were driven 60 ft. below street level in a stiff clay layer with points in a medium compact water-bearing clayey sand substratum (Fig. 5).

Floor slabs are of reinforced concrete, generally 5 in. thick. They are topped with a 5-in. thick concrete subfloor that weighs only 25 lb. per cu. ft. The finish consists of polished granite slabs separated by bronze strips in the ground floor lobby, marble where traffic is light, porcelain tile in toilets, and parquet of a special Brazilian wood (*Ipé*) in other areas.

Exterior walls are brick, faced on the outside with rose-colored granite in the lower three stories and porcelain tile (215,000 sq. ft.) above. Interior walls are generally faced with plaster. Special rooms have wood-paneled walls and ceilings or cane-fiber acoustic insulation. Most windows are double-hung, with steel sash, and are provided with venetian blinds as protection against sunshine.

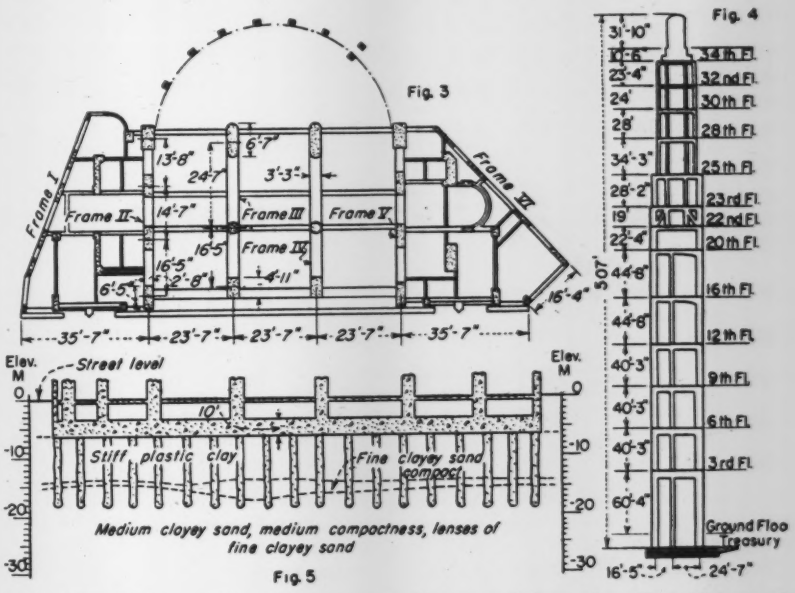


FIG. 3 TO 5. Frames I and VI shown in the ground-floor plan (Fig. 3) extend only to the 11th floor, whereas Frames III and IV (Fig. 4), as well as II and V, are 34 stories high. The building rests on cast-in-place concrete piles (Fig. 5).

Bank headquarters are located in the lower twelve stories and are served by 9 of the 13 elevators installed. The other four elevators have a capacity of 16 persons each and a rated speed of 690 fpm. Cabs are of steel faced on the interior with wood.

The concrete used in the structural frame was designed to satisfy the Brazilian building code. It varies in strength from 1,060 to 1,600 psi.

Built at a cost of $3,060,000, averaging $14 per sq. ft., the edifice was designed and erected by Companhia Construtora Camargo e Mesquita of Sao Paulo, under the supervision of J. Rangel de Camargo and J. de Mesquita. The author carried out the stress and stability investigations and the Instituto das Pesquisas Tecnologicas do Estado de Sao Paulo, the subsurface studies.

THE BASEMENT WALL for a new building in California was cast in short sections to prevent cave-ins.

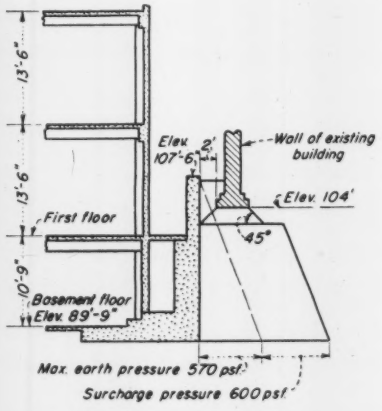
Retaining Wall Eliminates Underpinning

Norman B. Green
Structural Engineer
Los Angeles, Calif.

NEED for underpinning an adjoining structure was obviated and a considerable cost saving effected through the use of a retaining wall for a building recently erected in California. The wall solved the problem of preventing damage to the adjacent structure, which has footings at a higher level than those of the new building.

Conditions such as this, in which the basement and footings of a proposed structure extend below the footings of an adjoining existing building, frequently occur. In such cases, adequate means of support must be provided for the footings of the existing building lest the excavation for the new structure cause a displacement of the footings, with collapse of the building possible.

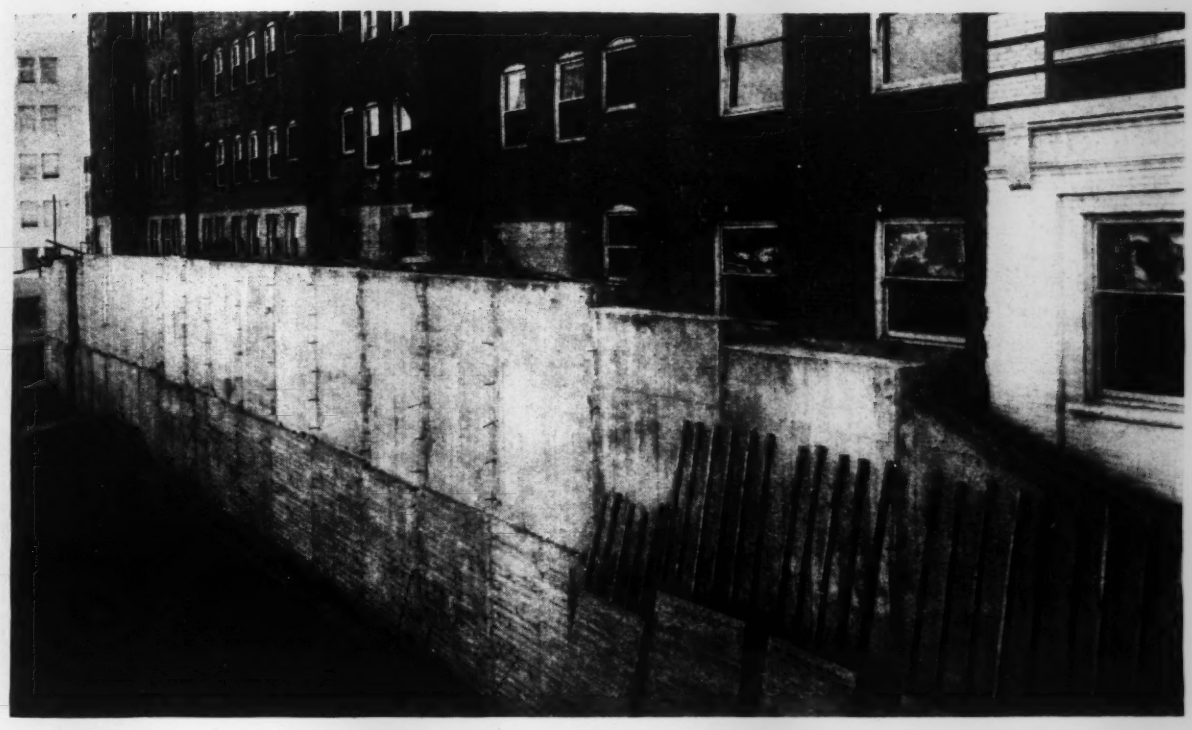
To provide the necessary vertical support for the existing footings, it is customary to underpin them with masonry down to the level of the bottom of the new footings. This underpinning operation is in part regulated by statute. In the state of California, the law requires that the owner of the existing building "be allowed 30 days, if he so desires, in which to take measures to protect the same from any damage, or in which to extend the foundations thereof."



SOIL PRESSURE against the wall was computed to be a maximum of 570 psf.; surcharge added 600 psf.

If, however, the existing footings go to "standard" depth (12 ft. below the curb level at the point where the joint property line intersects the curb), and the depth of the new footings is greater than standard, the law requires that the owner of the new building shall, "if given the necessary license to enter on the adjoining land, protect the said adjoining land and any building or other structure thereon without cost to the owner thereof, from any damage by reason of the excavation."

It will be noted that, for new footings with depths not greater than the so-called standard, the law does not definitely require the owner of the existing building to underpin or otherwise protect his structure, even though this may be essential from the standpoint of public safety.



DESIGNED AS A CANTILEVER, the wall resists pressures due to footings of the adjacent 5-story building.

Even though the requirements of the law in regard to underpinning vary somewhat in different states, there is always a legal problem involved. Delays in construction of buildings frequently occur pending a solution of this problem and the provision of underpinning.

In addition to the legal problem, there is also an economic problem incident to underpinning, since this is always an expensive operation.

Wall resists footing pressures

In the building project previously mentioned, the footings for a new two-story and basement building were extended to standard depth, but, nevertheless they were much lower than the footings of an adjoining existing five-story brick bearing-wall building. In lieu of underpinning the existing footings to the lower level, the basement wall of the new structure was designed to resist the lateral pressure the footings produce.

The depth of these footings and their distance from the new building varies along the property line, and consequently there is a variation in lateral pressure. The drawing shows the condition of maximum horizontal pressure against the basement wall.

This wall was designed as a reinforced concrete cantilever. A flexible joint was provided at the first-floor level, so that the wall can deflect laterally and resist its load independently of the new building. The base slab of the wall, however, supports the wall columns.

It is customary to construct underpinning in short lengths, so that only a relatively small portion of the foundation will be left unsupported at one time. The same procedure was followed in constructing the retaining wall, which was cast directly against the excavated earth face in sections about 8 ft. long. These sections were separated by construction joints designed to maintain both vertical and horizontal alignment by means of shear keys. Horizontal reinforcing bars are continuous through the joint.

The sequence of operations during construction is indicated in the pictures, one of which show sections of the wall completed, the reinforcing in place for adjacent sections, while portions of the original bank are still undisturbed. Construction was speeded by the use of high-early-strength cement, which made it possible to excavate the earth adjacent to a completed wall section only three days after workmen poured the concrete.

The selection of a proper length for the wall sections is important and is determined by soil conditions. In this case, a foundation investigation showed the soil to be a stiff clay interbedded with shale, the plane of bedding being vertical and perpendicular to the face of the wall. If the plane of bedding had been parallel to the face of the wall, or if a softer material had been encountered, there would have been considerable danger of a cave-in and a shorter wall section would have been required.

Savings Computed

The cost of the 184-ft. long cantilever retaining wall was estimated at $24,000 more than the cost of a conventional wall. The estimated cost of the underpinning for the existing building was $40,000. Therefore, there was an overall net saving of $16,000.

The firm of Gordon B. Kaufmann and James E. Stanton, of Los Angeles, were architects for the project, and Norman B. Green was the structural engineer. Construction was by T-S Construction Engineers Inc., for whom F. J. Huxtable was superintendent.

Bulldozer makes a runoff channel in fill being placed from dredge pipe on left to form Oregon highway.

Dredged Fill for a Scenic Freeway

ALMOST 10,000,000 cu. yd. of embankment, most of it dredged, will be required for the first 14-mile section of the new Columbia River highway.

To be opened for traffic in 1949, this section of the limited-access throughway follows a river-level route on the Oregon shore, starting just a few miles west of Portland. Much of the highway fill is located in the river itself, with rock toe walls and riprap as protection from the devastating flood flows of the Columbia. (The completed fill withstood the May-June, 1948, flood with no visible damage.)

Eventually, the new highway will extend on a river-level route all the way from Portland to The Dalles, Ore.—for a distance of some 90 miles by existing roads. It will connect the rich agricultural eastern part of Oregon with the state's economic and transportation center of Portland. The route follows the river through the Columbia River gorge, thus avoiding the Cascade Mountains.

Because the Union Pacific Railroad, built before highway travel became popular, takes up most of the available room on the narrow shelf along the river bank, the original 16-ft. highway had to follow a circuitous route on the bluff overlooking the river. The new route will save 4.7 miles of travel.

Project justified economically

Officials of the Oregon Highway Department and the Public Roads Administration believe that a parkway through the Columbia gorge is potentially one of the most attractive in the U. S. and much effort is being made to maintain and develop the natural beauty of this location. All curves on the route are long and sweeping with maximum curvature being 4 deg. Natural vegetation is carefully preserved, and in some locations, appropriate trees and shrubs are planned. Side slopes are planted with grass for beautification as well as to help hold the sandy material in place.

In one location an artificial lake was built, situated so that it reflects a waterfall, the lake level to be maintained by a weir in the discharge culvert.

Before authorization of construction, an economic study was made. In Oregon, the solvency, or benefit quotient, is computed for all new highway work. A ratio of annual monetary benefits to annual costs; benefits include all savings accruing to highway users. Included in the cost are annual maintenance and operation expenses plus amortization of the initial expenditure over a 30-year period. If this quotient is less than one, the project is considered insolvent and not built. For this highway job, the benefit quotient was computed to be 3.07.

Most of the saving is in better alignment and uniformity of grade. For this first section of highway, there is a total saving of some 4,000 deg. of curvature and a saving in rise and fall of 3,180 ft. The new route is 4.7 miles shorter than the old.

The present construction program will provide two 12-ft. lanes. The route is essentially for through traffic as population density along it is rela-

tively small. Should traffic increase significantly because of greater population or improved facilities, the highway can readily be expanded to four lanes. The dredged fill can be widened on the inside at a relatively reasonable cost.

Fill placed in the river

Three alternatives were available. First, the highway could be located up on the hill overlooking the river with improved line and grade as compared with the old route similarly located. Secondly, the highway could be placed between the bluff and the railroad by placing the latter on a new fill in many places. Finally, the highway could be placed on a fill on the river side of the railroad.

This third alternate would be most economical, but engineers hesitated to place the fill in the river. Experience with highway fills in a river with the flow characteristics of the Columbia is relatively limited.

Investigation showed that some industrial plants on the Columbia and Willamette rivers in the city of Portland were built on dredged fill. The slopes at these sites had riprap protection in flowing water, but in still water 6 on 1 slopes held up well. To help maintain such flat slopes, willows and other vegetation were planted. On the successful record of these industrial fills, the river-level route of the new highway was adopted. A similar type fill was used, the only modification being the placing of a rock toe wall in swift water (Drawing, next page.)

The new highway embankment was subjected to a flood test much sooner than anticipated—floods of late May and early June of 1948 closely approximating the maximum flow of record in 1894. The subgrade level is pegged at the elevation of the 1894 flood crest. The 1948 flood brought a flow estimated at 1,034,000 cfs., compared with 1,170,000 cfs. in 1894, and level of the recent flood was 3.3 ft. below the maximum of record. Oregon highway engineers believe that strengthening the river in this area has given it a greater volume carrying capacity.

There was no visible damage to the completed fill and surprisingly little wash action on the portions still unprotected by riprap. In spite of the increased elevation of the water, the dredge operated continuously during the flood until commandeered by the Corps of Engineers for emergency work in Portland.

Since the top of the finished pavement will be 1.5 ft. above the 1894 flood elevation, the highway grade is almost flat, with a rise of only 3 ft. in 15 miles. This makes the route ideal for the truck haul that comprises a significant portion of the traffic on the existing road.

No surfacing has yet been put on the fill. Paving, when placed, will consist of a 12-in. layer of compacted rock, topped with 3 in. of fine rock, and a 3-in. layer of bituminous macadam pavement. The 24-ft. wide pavement will have a two percent crown slope.

Work in three sections

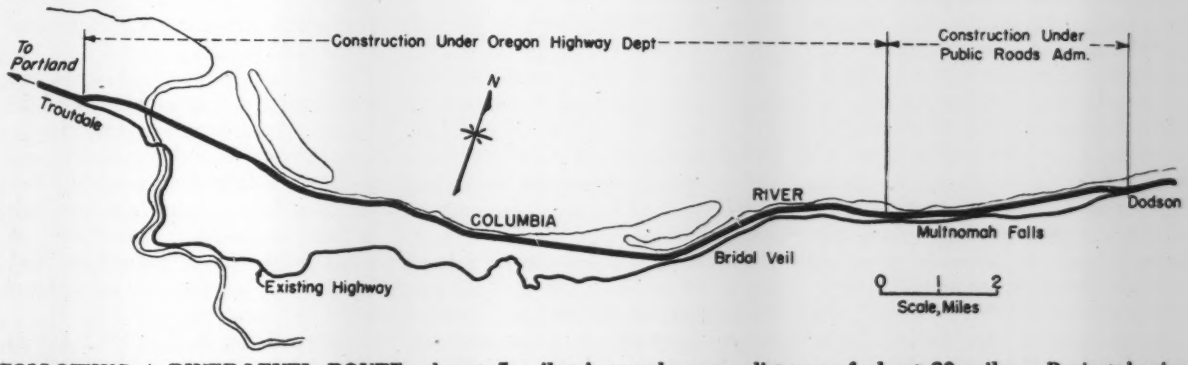
Not including bridges and overpass structures, the current work is divided into three sections. The first is less than two miles long and forms a bypass around the town of Troutdale to the Sandy River; no dredged fill work is involved on this portion. The second is 14 miles long and extends from Sandy River to Multnomah Falls; some 7,500,000 cu. yd. of hydraulic embankment and 800,000 cu. yd. of rock toe and riprap are required for this portion. The third portion of about 4 miles is from Multnomah Falls to Dodson, requiring 1,930,000 and 108,000 cu. yd. of hydraulic embankment and rock toe and riprap, respectively.

The work as far as Multnomah Falls is under the jurisdiction of the Oregon State Highway Department. From Multnomah Falls to Dodson, the highway is a Public Roads Administration project since it is located in the Mt. Hood National Forest. The project is thus being financed by state and federal funds—money for the Mt. Hood National Forest section coming from federal forest highway appropriations.

Contractor for dredged fill on both portions is the Hydraulic Dredging Co., Ltd., Oakland, Calif. Contract price is 26.6 cents per cu. yd. for the state's portion, slightly less for the PRA contract where fewer set-ups and less pumping distance is involved. Price for the rock fill portion averages about a dollar a cubic yard.

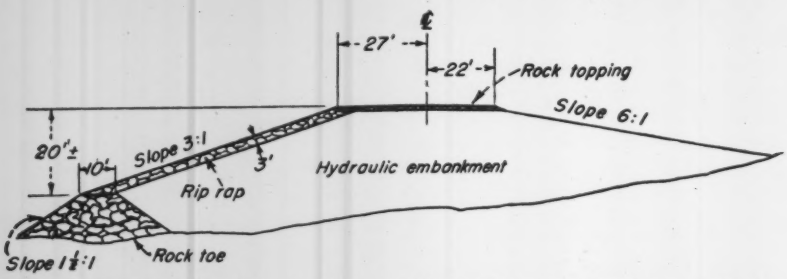
The sequence of operations starts with the placing of the rock toe wall. Then the hydraulic embankment is placed and shaped. Next, the 3-ft. thick riprap slope protection is placed along with the 12-in. rock surfacing. At a future date a bituminous surface will be placed.

Some of the rock toe and dredged fill was placed as long ago as 1939, when the Corps of Engineers had some channel dredging to do. An arrangement was made whereby the Army paid 15 cents a cu. yd. for removing the material and the state paid 12 cents a cu. yd. for having it placed in the highway fill. Some 2,-



FOLLOWING A RIVER-LEVEL ROUTE, almost 5 miles is saved over a distance of about 20 miles. Project begins some 16 miles east of Portland.

RIPRAP partly in place on the dredged fill shows smoothness of the slope.



DREDGED FILL placed in the river is held in place by a rock toe wall. On the other side of the fill scouring action of the river is negligible.

800,000 cu. yd. was placed under this contract.

Most of the fill thus placed stood for more than 8 years without riprap protection. When work was once again started on this highway only a little reshaping of the old fill was necessary, as it had eroded slightly in some sections due to wave action.

The dredging contractor on the current contracts originally intended bringing an electrically powered dredge from California for the work. However, he found that surplus power was not available from the Bonneville Power Administration because of the high demand for power in the Northwest. Accordingly, the contractor rented the dredge Clackamas from the Port of Portland. Contractor personnel man the dredge.

This dredge is powered by 3,700-hp. diesel-electric, motor-generator sets. A 30-in. suction dredge, it can pump through 8,400 ft. of line, of which 2,500 ft. can be afloat offshore. Production has averaged 20,000 cu. yd. of fill a day in place and has been as high as 35,000 cu. yd. a day.

To permit 24-hour operation of the dredge, two to five outlets are used at each set-up. This makes it possible to fill alternately at one of several spots while the pipe sections are being added at other locations or work is being done to shape the fill.

A dike is first thrown up by a dragline crane to retain the dredged material. Then, as the dredged material enters the highway alignment, terraces are formed by a track-laying tractor equipped with a bulldozer so that maximum quantities of the suspended material can be reclaimed. Much depends upon the manner in which the terraces are formed and the operators become highly skilled at manipulating the tractors and moving the material to best advantage.

A significant quantity of material is involved in the program to grow grass on the unprotected slopes. Most of the dredged matter is sand, which is covered with 4 in. of top soil. On riprap not exposed to river action, a 2-in. thickness was placed. Total top soil moved was 114,000 cu. yd. Some 280 acres of grass was sown, using a mixture of the following seed: Rye, fescue, highland bent, white clover, and velvet. Because of the relatively damp climate, no reseeding or artificial watering is believed necessary.

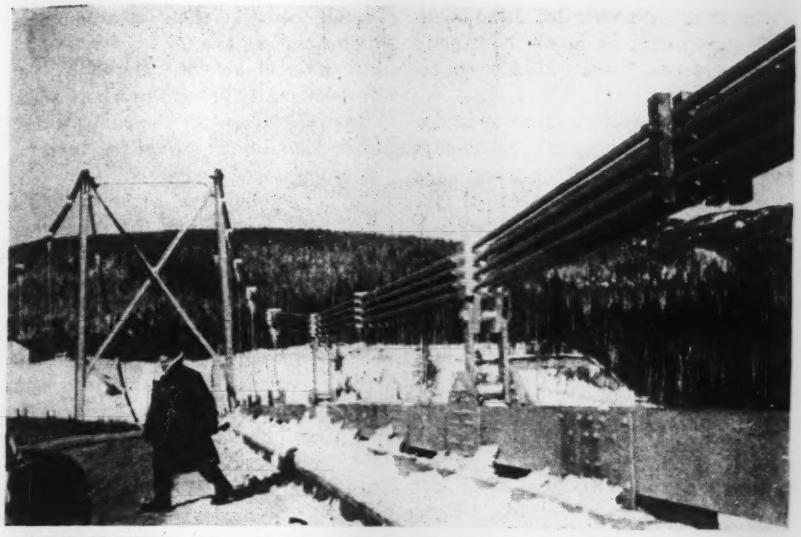
This project was designed by the Oregon State Highway Commission, R. H. Baldock, state highway engineer. Construction is under the direction of H. G. Smith, construction engineer, and Ray Webber, assistant construction engineer. Carl A. Peterson is resident engineer. E. G. "Hydraulic" Smith is general superintendent for the Hydraulic Dredging Co., Ltd., and Capt. Elmer Norman is dredge captain. Contract for the rock embankment is held by M. J. & J. N. Conley, Portland, Ore. Public Roads Administration was represented by W. H. Lynch, division engineer; R. N. Kellogg, division construction engineer; J. B. Reher, locating and design engineer; and Gean Ewen, resident engineer.

Hints on Avoiding Decay And Termites in Houses

A new bulletin, *Decay and Termite Damage in Houses*, suggests yearly inspections to determine possible decay and termite damage to the wood parts of houses.

The bulletin, prepared by forest pathologists and entomoligists of the Department, contains many clarifying photographs and how-to-do-it and how not-to-do-it drawings. In brief, it shows how a house can be made to last indefinitely by protecting all wood in the lower parts from soil-inhabitating termites and decay fungi and from excessive moisture.

The bulletin, F. B. 1993, may be obtained free from the U. S. Department of Agriculture, Washington 25.



CABLE CLAMPS of wood spacer blocks installed midway between suspenders have eliminated vibration and broken wires in cables of Liard River Bridge on the Alaska Highway.

Cable Vibration on Alaska Bridges

Raymond Archibald

Engineer, J. E. Greiner Co., Consulting Engineer, Baltimore, Md.
Formerly Bridge Engineer, Public Roads Administration

SINCE the completion of the two suspension bridges on the Alaska Highway in 1943, it has often been observed that individual strands of the open-type cables vibrate between the suspender clamps, due to wind action. In 1945, a few broken wires were discovered on the Liard River Bridge and later, on the Peace River Bridge also.

The damage has affected only a very small part of the cable area, and simple means have been employed to minimize the vibration—which is expected to stop breaking of the wires—but the subject is one in which the engineering profession has a vital current interest.

The bridges were built under the supervision of the U. S. Public Roads Administration and were later turned over to the Canadian Government, which has assigned the maintenance and operation to the Royal Canadian Army Engineers. Both bridges were designed for reinforced concrete decks, but a temporary timber deck was placed on the Liard River Bridge, resulting in a lower dead-load cable stress than provided in the design. In the Peace River Bridge (main span of 930 ft. with 465 ft. side spans) each cable consists of 24 $1\frac{7}{8}$ in. prestressed parallel wire bridge strands arranged in an open rectangular pattern, four strands wide by six deep on $3\frac{1}{2}$ in. centers. In the Liard River bridge (main span 543 ft. with 245 ft. side spans) the cables have 12 $2\frac{1}{16}$ in. strands each, three wide by four deep on 4 in. centers. Suspender clamps are spaced 38 ft. 8 in.—far enough apart to allow the cable strand to oscillate in the wind.

Simple vibration

All vibrations of the strands, observed in the wind or excited by hand, have been fundamental (i.e. single wave motions) between suspender clamps. Vibrations occur in practically all panels though never in all at the same time, depending on the direction and velocity of the wind. The observed frequency of vibration does not vary materially from panel to panel in the same bridge although theoretically the frequency in the panel next to the tower should be about 15 percent less than in the midspan panels as far as length of strand is concerned.

Approximate counts indicate 588 vibrations per minute at Peace River and 420 at Liard River. Double amplitudes of about $\frac{1}{2}$-in. have been observed in the wind. As much as $1\frac{3}{4}$ in. double amplitude was induced at Liard River by hand and somewhat less at Peace River, no doubt because of the greater dead load tension.

Windward strands do not vibrate

It has been consistently observed that the windward vertical row or tier of strands of the cable do not vibrate. This phenomena is confirmed by the apparent lack of wire break in the windward strands. Apparently the vibration is set up by wind forces which act upon the leeward strands because of the periodic turbulence in the wind stream resulting from its flow around the windward strands.

Usually also the windward cable shows more strands in motion than the cable to leeward, probably because the deck and trusses disturb the wind stream. As might be expected this difference is less noticeable when vibration occurs in the higher cable panels near the towers.

Most of the wire breaks appear to have occurred during the winter when temperatures are often between 20 and 40 deg. below zero and sometimes as low as 70 deg. Although the wire breaks are no doubt the result of a large number of repetitions of stress over a period of several months, it appears the fatigue limit is reached sooner during the extremely cold weather.

The locations of the wire breaks may be interpreted as indicating the strand positions most subject to vibration in the winter time. Of the 34 breaks at the Liard River reported August 1947, 33 were in the east cable which is the windward side of prevailing winter winds, and on the Peace River Bridge, 49 of the 71 breaks were also in the east cable. In the individual cables at Liard, 18 breaks occurred in the middle tier of strands, 14 in the west tier and only two in the east tier. On the Peace River, all but two of the breaks occurred in the two interior tiers of strands.

The wire breaks all occur in the outer layer of wires, largely in the top half of the strand circumference

and immediately adjacent to the suspender cable clamps. There seems to be no doubt but that the breaks are closely associated with the slight kink in the wire where it emerges from the groove in the cable clamp.

In March 1947, an effective means of preventing the fundamental vibrations of the individual strands was installed on both bridges. Cable clamps composed of wood spacer blocks placed vertically between and outside of the tiers of strands, securely bolted together, were placed midway between the suspender cable clamps. After these were installed, little or no vibration could be induced by hand and only two breaks have been reported since.

In the design of this type of bridge cable, the spacing of the clamps should be carefully determined so as to prevent the oscillation of the strands and provision should be made in the design of the suspender clamps to eliminate the sharp kink in the cable at the ends of the clamps. These two design features apparently contributed to the breaking of the wire on these bridges.

Notes on Legal Decisions

Summaries of decisions relating to construction prepared by I. Vernon Werbin, counselor at law and engineer, New York

Substantial Performance

Ordinarily, where one has entered into a contract to perform work for a named consideration he is not entitled to compensation unless he has fully performed the contract. An exception to the rule is made in the case of construction contracts, where the contractor is allowed to recover where he has substantially performed the contract.

Substantial performance means performance of all the essentials necessary to the full accomplishment of the purposes for which the thing contracted for has been constructed, except for slight defects that can be readily remedied or for which an allowance can be made from the contract price. Deviation or lack of performance, which are either intentional or so material that the owner does not get substantially that for which he bargained, are not permissible. Under the rule of substantial performance there is no general license to install whatever, in the builder's judgment, may be regarded as "just as good." A contractor who intentionally deviates from the contract in performance cannot recover—the willful transgressor must accept the penalty of his transgression—for him there is no occasion to mitigate the rigor of implied conditions.

The transgressor whose default is unintentional and trival may hope for mercy if he will offer atonement for his wrong. In such cases the true measure of damages is the difference between the value of the job as finished and as it might have been finished under the contract, plans and specifications.

It is the modern rule that substantial compliance with a building contract is all that is required. Where the contractor has in good faith and honestly sought to comply with its terms, but has failed in minor respects, his right of recovery cannot be defeated under the contract, but will be offset by the amount required to complete the contract.

Some of the cases holding that substantial compliance only is required hold that the action is brought upon the contract and the amount due thereon is subject to deductions for damages arising from improper performance; others hold that the contractor is entitled to recover on a *quantum meruit*. But, a contractor acting in good faith and with a determination to do what he has contracted to do, should not suffer if he has, unintentionally and without negligence in some small matter, departed from the strict terms and details of his specifications[1, 2]. Unless a contractor, under these circumstances, would be allowed a recovery, there would be a forfeiture of his work, labor and material to the unjust enrichment of the owner[3].

While the weight of authority permits a recovery upon the contract on proof of a substantial performance, the full contract price cannot be recovered, unless the owner has accepted the work done as a complete performance. The mode of ascertaining the real benefit derived by the owner is to estimate the whole work at the price fixed by the contract and to deduct the sum required to complete the unfinished work[4].

Where a building or construction contract is entire and the contractor voluntarily and without excuse abandons the work after part performance, he will not be entitled to compensation for the work done[5]. In Louisiana, by special statute, a contractor who fails to perform a construction contract can recover the value of the work done that insures to the benefit of the owner, even though the work was defective[6]. If a price has been agreed upon for the work, the owner's remedy is to reduce the price by the amount that he will necessarily expend to perfect or complete the work in accordance with the contract.

The burden is on the contractor to show that the defects and omissions were not substantial as well as the amount required to make them good, so that the sum can be deducted from the contract price and a recovery had for the balance[7, 8].

(1) Cueroni v. Coburnville Garage, Inc., 52 (2d) 16.
(2) Patrick v. Bonthius, et al., 124 P.(2d) 550.
(3) Speed v. Bailey, 153 Md. 655, 139 A. 534.
(4) Hammacker v. Schleigh, 147 A. 790.
(5) Elliott v. Caldwell, 43 Minn. 357; 45 N.W. 845, 9 L.R.A. 52.
(6) Bouterie v. Carre, 6 So.(2d) 218.
(7) Simpson, et al. v. Cafe La Vie, et al., 123 Misc. 947; 206 N.Y.S. 650.
(8) Blanchard, et al. v. City of Saratoga Springs, 217 N.Y.S. 573; 241 App. Div. 193.

Right To Rescind Contract

Rescission is an equitable remedy designed to afford relief from contracts entered into through mistake, fraud or duress.

Ordinarily, the nature of the relief asked in such cases must be such as would place the parties in their original situation. Where one party with knowledge of facts entitling him to a rescission of the contract, afterwards ratifies it without duress, he is not entitled to have it cancelled. Ordinarily an express ratification is not necessary in order to defeat the remedy of rescission. Acts or conduct inconsistent with an intention to avoid it, or in recognition of the contract, has the effect of an election to affirm it. (Morse, et al. v. Kogle, et al., 178 P. (2d) 275).

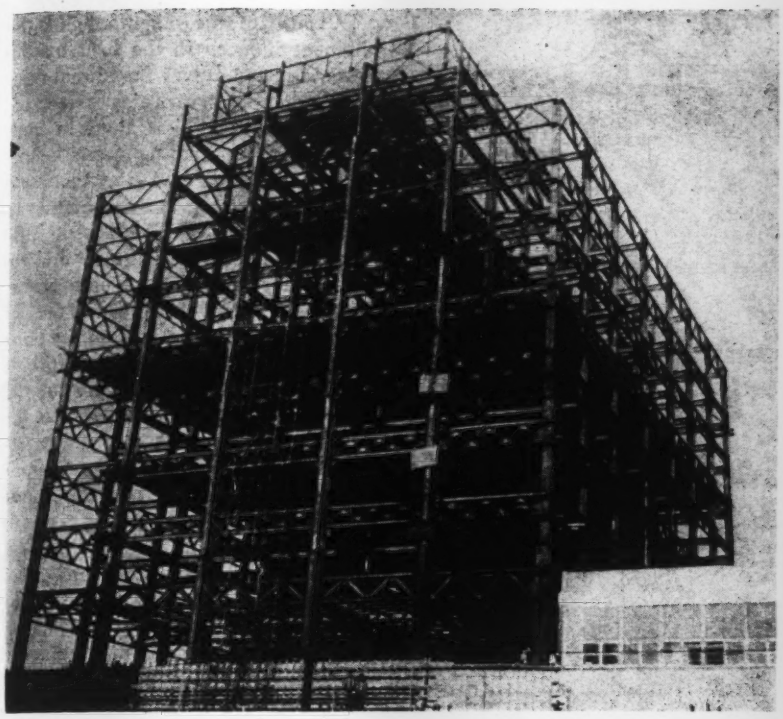


FIG. 1. COMPLETED STEEL FRAMING of the New *Los Angeles Times* Building. Note spandrel trusses. Seismic resistance of outer wall bents is 2½ times that of interior bents.

Seismic Factors Control Design Of Ten-Story, Steel-Frame Building

D. Lee Narver
Structural Engineer,
Holmes & Narver, Consulting Engineers,
Los Angeles

A TEN-STORY, steel-frame building, designed to provide seismic resistance required under the 1945-46 Los Angeles City Building Code, affords an example of how horizontal forces of 13½ percent of the dead load can be carried at top-floor level with successive decreases to 5 percent on the second floor.

Occupying an area of 120 x 165 ft., the new structure adjoins other buildings erected some years ago for the *Los Angeles Times*, and is to provide space for growth and expansion of the newspaper's plant. The three basements and the first five floors will be for presses and other publishing functions; other floors will be occupied by offices.

The presses require head-room three stories high. Above the space they occupy building columns are supported on heavy girders. A loading concourse extending into the new building at the first floor level has a width of 45 ft. and in order to leave this free of obstructions the columns above are carried on heavy girders. As most of the three lower floors and basements will be used in connection with the printing operations, the design provides here for a live load of 250 psf up to and including the second floor and 125 psf on the third. Above the third floor the provision is for the usual 70 psf. The massive presses themselves are carried on piers independent of the building foundations to avoid transmitting vibration to the steel frame.

Because the lower floors are devoted almost entirely to machinery for newspaper production, the heavy equipment for air conditioning, the cooling tower, etc., is enclosed in a pent house on top of the building. With this situation and under the new city building code the horizontal force to be carried at roof level is 1,500,000 lb. At the third floor level this load becomes 2,670,000 lb.

In calculating the effect of such horizontal forces, attention was given to the difference in period of seismic vibration in the three separate buildings which are here grouped and interconnected. To take care of these differences, earthquake joints were used between the three structures—where physical contact was necessary, provision was made for a slip-joint so that movement of one structure in response to seismic forces could not be transmitted to the framework of the adjoining building.

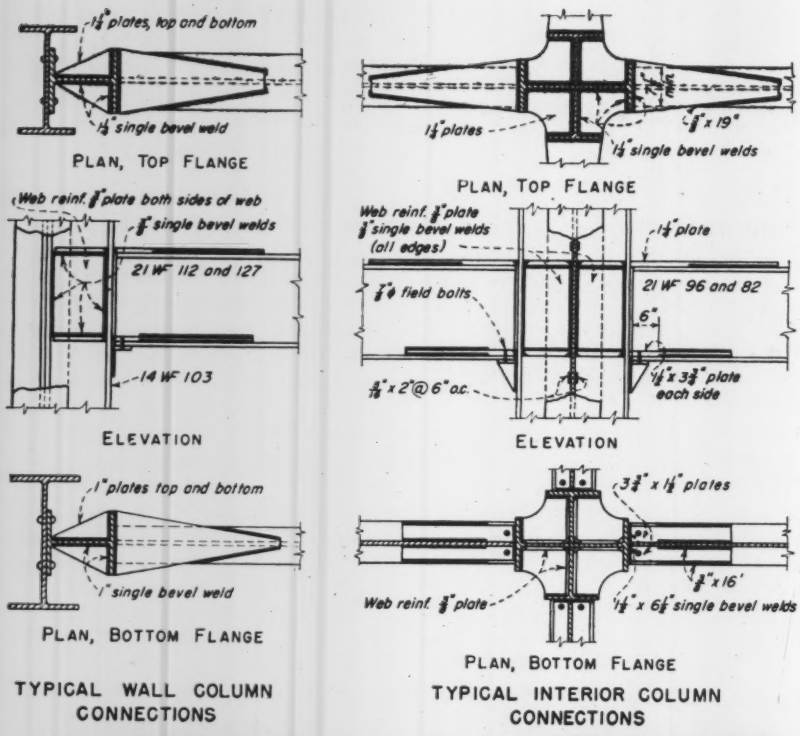
The structural steel frame shown in Fig. 1 will be housed with exterior walls of concrete faced with stone, except in the removable panels of the west elevation where reinforced brick construction was used. A two-way concrete joist system was used for the floor framing. Column spacing was varied somewhat but was approximately 23 ft. in both directions.

Due to the desirability of continuous windows above the third floor for lighting and flexibility of internal partition arrangement, structural exterior wall bracing was not used above that level. Hence all of the horizontal loads were taken in moment-resisting connections between beams and interior columns and between truss spandrels and columns in the exterior walls.

Interior bracing

In the interior of the building no permanent walls were available for seismic bracing except those enclosing the elevators and stairways. Considerable stiffness could have been designed into the east wall, but it was not possible to utilize this as no stiff counterbalancing elements were available elsewhere to bring the center of resistance into line with the center of thrust.

Below the third floor, sufficient concrete wall area was available to take all the seismic shear. Up to this level the steel frame was of conventional design using standard "H" column sections and standard riveted beam-



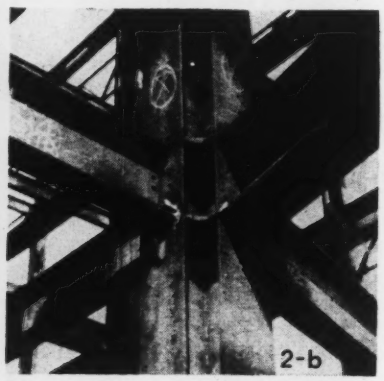


FIG. 2. TYPICAL WELDED CONNECTIONS for maximum rigidity in resisting horizontal forces are shown in the drawings (left) for outer walls and (right) for interior columns. The pictures illustrate (2-a) outer and (2-b) interior column connections.

to-column connections carrying static loads only.

Since the strength required in interior columns was about equal in both directions above the third floor, these members were made up of two 24-in. WF sections. One section was cut longitudinally along the center of the web to form two "T" sections. The stems of these T's were welded to the web of the other 24-in. beam to form a 24 x 24-in. cross-type column with four flanges available for beam connections, as shown in Fig. 2. Exterior wall columns were formed by riveting one flange of a 14-in. "H" section to the web of a WF beam.

The relative stiffness of an exterior wall bent to that of an interior bent is approximately 2½:1 with this arrangement. Accordingly, the horizontal seismic shears were distributed to these elements in that ratio. Welded instead of standard riveted beam-to-column connections were used to conserve space. Typical connection details are shown in Fig. 2. Plates to provide continuity of stress through the column section at the levels of the top and bottom beam plates were welded in the shop to the column flanges and webs.

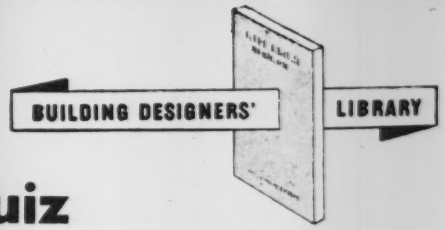
Because of the magnitude of the moment induced in the bent by the seismic shears, it was found that relatively heavy floorbeams were required for these loads alone in both directions. In loading these beams equally with the two-way concrete joist floor framing, it was possible to take the static floor loads with little increase in beam weight over that required for seismic moments alone. This also made possible the use of similar beam connections on the floor flanges of the columns, and the floor provided a strong diaphragm for the distribution of seismic shears to the resisting elements.

Beams were connected to columns by means of top and bottom flange plates, butt welded to the columns and fillet welded to the beam flanges. Conventional welded beam seat brackets were shop welded to the column flanges to take all vertical shear. To prevent the butt welds on the flange plates from assuming any of the vertical shear, the fillet welds connecting the top and bottom plates to the beam flanges were kept back some distance from the face of the column to allow flexibility for vertical displacement. The lower flange plate connection was made with two plates resting on the upper side of the beam flange on both sides of the beam web. This arrangement made it possible to do all the field welding from above in a downhand position.

In order to eliminate distortion resulting from shrinkage in the butt welds, all butt welds of beam plates to columns were made before the fillet welds connecting the plates to beams.

The general sequence of welding beams to column joints was from the center of the building outward in all directions to the exterior walls. All floorbeam connections to any one column in a tier were made at the same time. This sequence of welding in all directions toward "free" ends in each column tier was adopted to minimize "locked up" stresses in framework members.

The building was constructed for The Times-Mirror Co.; Rowland H. Crawford, Beverly Hills, architect; Holmes & Narver, Los Angeles, structural mechanical and electrical engineers. Contract for construction was carried out by the P. J. Walker Co., Los Angeles.



Radiant Heating Quiz

Here are the answers to questions frequently asked by architects, engineers and contractors, as compiled by the research staff of A. M. Byers Co., Pittsburgh, Pa.

What is radiant heating?
Radiant heating maintains comfort conditions primarily by restricting body-heat loss by radiation to room surfaces. Rooms are heated by hot water circulated through coils of pipe within the floors, ceilings or walls.

What are the advantages of such a system?
The advantages are many and have been verified by thousands of operating systems. The principal ones are: 1. Complete use of floor area. No space-consuming radiators or duct work; greater freedom for interior decoration. 2. Cleanliness. Because of the absence of air currents associated with conventional heating systems, walls and curtains remain remarkably clean. 3. Comfort. With radiant heating, particularly in the floor, a warm, comfortable feeling is generated where it is needed most. Furthermore, radiant heating does not dry out the air, and a noticeable freshness is achieved. 4. Savings. Operating economy of radiant heating has been reported from all types of buildings in a wide variety of climates.

How does the cost compare?
Usually, with an experienced contractor, the cost is the same as or less than that of a good conventional hot-water or steam-heating system.

Are fuel bills lower?
Yes, owners claim savings ranging from 10 to 25 percent and more. This may be readily understood when it is considered that, with a radiant heating system, lower thermostat settings are possible; roof losses are less because absence of air stratification results in air temperature near the ceiling being from 5 to 15 deg. F. less; and wall losses may be smaller in some cases because of less movement of air against cold surfaces.

What is the best location for radiant heating coils—floor or ceiling?
Both locations have been successfully used, but by far the greater number of installations are in the floor. There are a number of good reasons for choosing a floor layout, but probably the most important is that a floor system delivers the heat where it is most wanted—close to the lower extremities. Other advantages to the floor location are comfort with basementless constructions, lower cost, ease of construction, greater heat output with the same surface temperature, and the fact that floor coils permit the use of low-cost concrete floors. Ceiling coils have their place, however, where wood floors and joists are desired.

Can an efficient system be installed beneath wood floors?
Wood floors, both double and single, have been successfully used over radiant heating coils. They do, however, require more pipe than a concrete-floor or plaster-ceiling installation, respond to controls somewhat slower, and normally require higher water temperatures.

What floor coverings may be used?
Asphalt tile, rubber tile, ceramic tile, linoleum, carpeting, paint, terrazzo, wood parquet and many other materials work well from a heating standpoint. For concrete slabs on grade, most manufacturers of bituminous base materials recommend the use of asphalt tile. The floor covering to be used, however, should be decided upon before designing the heating system so that proper allowances may be made for materials that have a major effect on heat transfer. The coverings may be applied with standard mastic materials as a general rule, but it is recommended that the manufacturer be consulted on this point.

Can a basement and the story above it be heated from a single coil in the slab separating them?
The majority of designers have not found this to be good practice. Although such a plan is workable, control of the temperature in one of the areas may be poor. Where comfort is one story is not essential, the use of one coil or set of coils may be feasible.

How is a radiant heated ceiling constructed?
With rigid wrought iron pipe, the accepted method is to suspend the coils from the ceiling joists by ordinary pipe hangers. Lath can then be tied to the coils and the plaster applied, taking care to work as much as possible up and around the pipes.

Is radiant heating detrimental to plaster?
Many wrought iron radiant heating systems have been installed above plastered ceilings with complete satisfaction. When the procedure outlined in the preceding question is followed, the lath acts as a distributor of the heat and apparently removes the danger of cracked and streaked plaster. Ceiling systems are generally designed for a maximum water temperature of 130 deg. F. to minimize the possibility of dehydrating the plaster.

What characteristics should be sought in radiant heating pipe?
First of all, pipe should be highly resistant to corrosion, since it will be inaccessible when the structure is completed. Secondly, the pipe should be easily fabricated into desired shapes by common bending and welding techniques. Third, it should have a coefficient of expansion close to that of the masonry in which it is to be embedded so that neither the pipe nor the masonry will experience

any undue strain when heat is applied. Lastly, it should have sufficient strength to withstand accidental blows and other rigors of construction and remain rigid during installation.

Can the amount of pipe embedded in a concrete slab be substituted for an equivalent length of required reinforcing rods?

It seems logical that the pipe will have a reinforcing action and increase the strength of the slab. To date, however, this question has not been studied sufficiently to permit a decrease in the normally specified amount of reinforcement.

What tests should be applied to a radiant heating system before the floor is placed?

The system should be thoroughly tested either pneumatically or hydraulically. A standard that has been widely followed is to put the entire heating system, with the exception of the boiler and accessories, under a hydrostatic pressure of 125 psi. and maintain this pressure for at least four hours.

Should insulation be placed under pipes laid on the ground?

It is very doubtful that any measurable economy is to be gained from this practice. By far the greater portion of the heat losses from the slab takes place through the edge, and insulation beneath the coils will result in little saving even if it is 100 percent effective. This, of course, applies to normal conditions, and where water, rock, or other unusual conditions are present, the problem should be given special study.

How much insulation is desirable above ceiling coils in the upper story?

It is usually thought economical to provide sufficient insulation to reduce the upward heat loss to 10 or 15 percent of the total panel output. Two to four inches of batt-type insulation should be sufficient. An equivalent amount of insulation in the form of rigid, loose fill, or reflective material is also considered acceptable.

Should the pipes be fully embedded in a concrete slab or located in the fill beneath it?

Radiant heating coils may be placed in the center of the slab, or embedded in the lower portion, or they may be placed in the fill beneath it. All three locations have been successfully employed, although good contact between the pipe and concrete is desirable.

Does the floor get too warm?

There are floor temperatures that cannot be exceeded without discomfort. With normal building construction, however, this question should cause little concern. Floor temperatures up to 90 deg. F., or slightly higher, have been found acceptable; only in thermally-poor types of construction will it be necessary to exceed this value.

What are suitable materials for the fill under a radiant heated slab?

Any non-acid producing, good drainage material such as ordinary gravel, sand, or limestone is permissible. Cinders or other sulphur-bearing materials should not be employed since they generally react with moisture to form sulphuric or sulphurous acids.

How thick should the concrete be between the floor surface and the tops of the pipes?

It is generally considered sound to allow a cover above the pipes equal to the outside diameter of the pipe, or 2 in. whichever is the greater. Where a finish floor covering is to be used, hair-line cracking may not be objectionable and a thinner cover may be considered.

Is it desirable to use wire-mesh reinforcing above the pipes in a concrete slab?

Wire mesh may be used to advantage where the thickness of concrete above the top of the pipe is at a minimum. This mesh then will distribute stress, thus serving to prevent concrete failure, and will spread the heat more uniformly throughout the slab.

When should a grid pattern be used instead of a sinuous coil?

The circulator size is a limiting factor. As a rule of thumb, engineers have found that when designing for a 10-deg. F. drop in water temperature, a grid is best where the amount of pipe in a single area exceeds 300 ft. of 1¼-in. pipe, or an equivalent hydraulic length in other sizes and for other temperature drops.

What provision should be made for draining?

Where it can be conveniently included, a slope of ¼ in. in 10 ft. of pipe should provide positive drainage. Otherwise, a compressed air fitting should be included in the piping system so that the water may be blown out, if necessary. The latter method is most common, since it is quite difficult to slope coils in two directions to eliminate all water pockets.

What provision should be made for venting?

Venting plans must be adequate to remove all air from the pipes. This can generally be accomplished by a manual or automatic vent at the boiler, at the top of each vertical riser and at points where flow changes from horizontal to downward. Vents at the extreme ends of mains are also advisable in level systems. When systems are filled, water should be permitted to flow into one main only, the other being valved off until the system is full.

Should the circulator be on the supply or return side of the boiler?

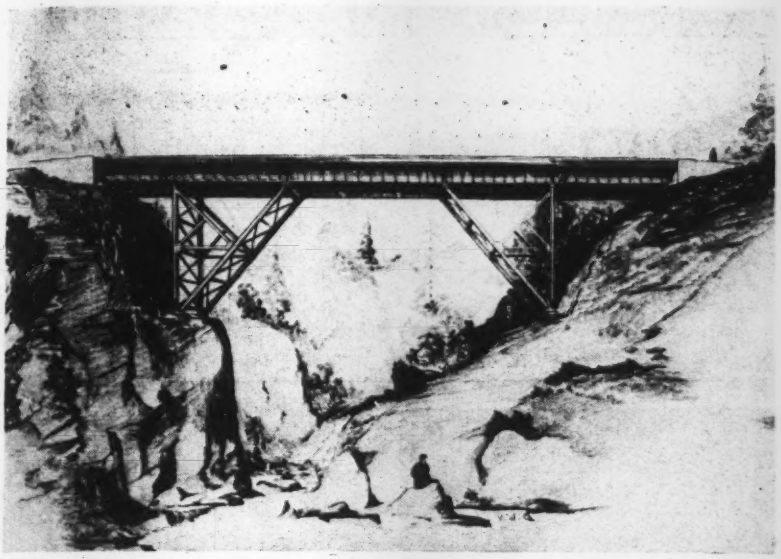
Either location can and has been used successfully.

Are balance valves necessary for each coil?

Yes. These are essential for complete control of the temperatures in all rooms or other partitioned areas.

What provisions should be made to prevent freezing if the owner goes away in the winter?

There are three ways of meeting this problem. 1. The system may be drained. 2. Anti-freeze solution may be added to the water. 3. The system may be kept operating at a low temperature while the owners are away. The last is probably the simplest and can be carried out for a very small cost if the thermostat is set back to maintain 50 deg. F. or lower, if possible.



A SIMPLE PIN-CONNECTED steel bridge design was substituted for a concrete arch design on an isolated highway stream crossing in California when . . . .

Bids on California Bridge Job Showed Shop Fabrication Cheaper

RECENT EXPERIENCE on bids for a bridge job in an isolated location in California indicates that designs including large amounts of hand labor in such field locations are prohibitively expensive as compared with designs that include much shop fabrication.

In one specific instance, a small bridge job across Rock Creek in Mendocino County some miles from the nearest town made it possible to make a direct comparison of a concrete arch and a steel design. Bids were called on the two different designs a few months apart. The concrete design, which entailed much hand labor formwork, would have cost considerably more than a steel design, which could be largely shop fabricated.

The crossing in question was required to be 256 ft. long and have a roadway of 26-ft. width. Because of the nature of the abutments—almost solid rock—and because of the distance between grade and streambed level (140 ft.), this location was originally considered to be an ideal place for a concrete arch bridge. Accordingly, when the design was made during the latter part of the war as part of the postwar construction backlog, a concrete arch of 172-ft. span was called for. The designers assumed that large quantities of skilled and unskilled labor would be available.

Concrete bids are high

Bids were called three times in 1946 and 1947 on the basis of a concrete design. On the first opening, no bids were received; on the second one bid was submitted and on the last, two were opened. All were considered too high. It is believed that the reason for the few, high bids was that concrete arch work requires a lot of hand carpentry for formwork and contractors could not get carpenters to work in an isolated location when good jobs were available in town.

This resulted in reconsideration of the design and the adoption of the design shown in the accompanying illustration. Although material cost on this steel bridge may be higher, and the architectural appearance poorer, the bids received indicate that it is much cheaper.

This bridge is, in effect, a four-hinged steel arch supporting continuous deck plate girders. The vertical members are hinged at top and bottom, as are the diagonal members, and there are separate pins at the abutments for the vertical and diagonal member. This permits these members—as well as the plate girders actually supporting the bridge deck—to be erected in the field with a minimum amount of labor, after being fabricated in the shop.

Small field force needed

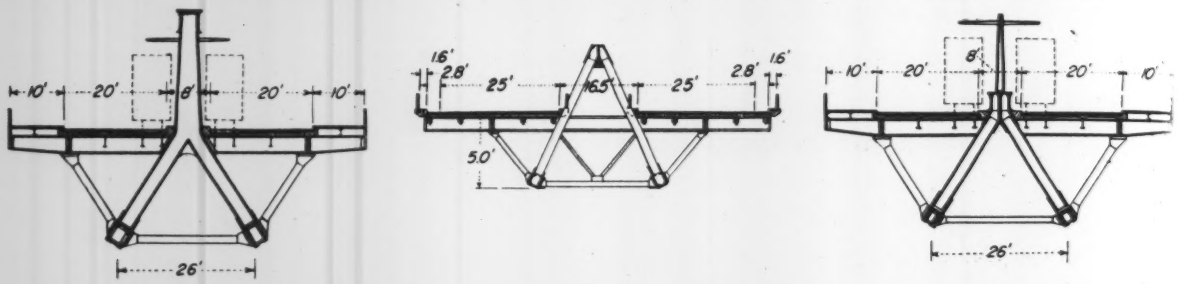
Although the construction sequence has not been worked out as yet, it is believed that the contractor will have little difficulty in keeping field forces to a minimum. A possible method is to place the vertical and diagonal supports from the bank by means of a crane and hold them in approximate position with cables. Plate girders used for pavement support can then be rolled out on these supports and pin-connected. The closing section of the plate girders (each girder has a splice section near the center) can then be placed while the supports and other girder sections are held in position by the cables.

An interesting sidelight is pointed out by the engineers in connection with deflections. Maximum deflection occurs when a load is applied just over the point where the diagonal support is pin connected to the plate girders. A wooden model built by the designers confirmed calculations in this respect. To keep deflection to maximum allowable was a simple problem of making the plate girders deep and heavy enough for the design load (H20–S16–44).

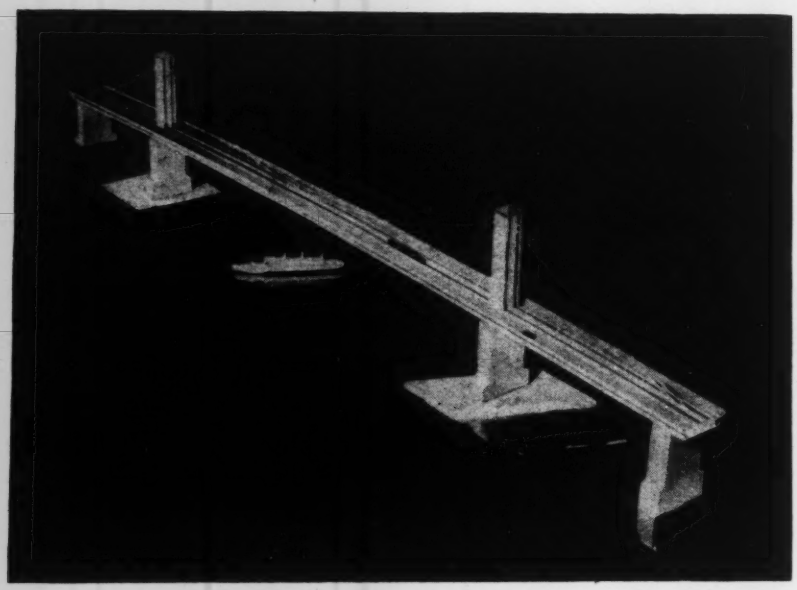
The design was made with a view toward availability of materials and ease of construction. For example, all steel was kept less than 60 ft. long. In the case of the 75-ft. 5-in. diagonal supports, a splice was provided. The bridge is 256 ft. long and the main span is 166 ft.

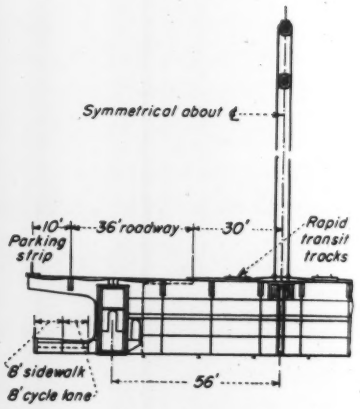
This bridge is a project of the California Division of Highways and the design was prepared under the supervision of F. W. Panhorst, assistant state highway engineer (bridges). Low bidder on the construction was H. W. Ruby, Sacramento, Calif., and the bid amount was $167,100, of which $58,200 was for roadwork in approaches.

THESE ARE MIDDLE-SUPPORT BRIDGES:

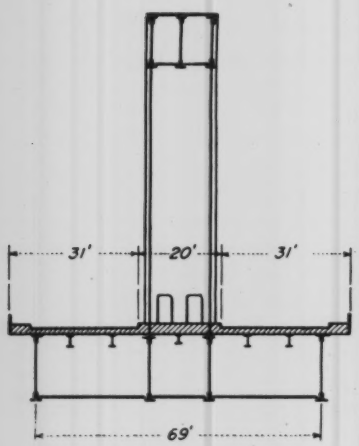


Three variations of truss spans





Suspension bridge with center cables



Arch span with a single rib

These bridges claim the Germans who developed them, save on steel and foundations and serve modern traffic more efficiently, as told on the opposite page.

New Type Bridge Proposed by Germans

UNDIMMED BY WAR, the ingenuity and daring of German bridge engineers are beginning to be applied to post-war reconstruction needs. First to be noted was the new Rhine bridge at Cologne (ENR Oct. 30, 1947, vol. p. 504) in which a 605 ft. plate girder span is made possible by counter-weighting the adjacent spans with an extra-heavy roadway slab. Now comes an even more spectacular proposal: use of only a single main carrying member—a truss, an arch rib or a cable—located on the centerline, with the roadways cantilevering out at either side.

Characterized as a "Mittelträger-brücke" or "middle support bridge," it is described in the February and March, 1948 issues of *Die Bautechnik* by Willy Haupt, chief engineer of Dortmunder Union Bruckenbau, German construction firm, who has furnished this supplemental information to *Engineering News-Record*.

According to Mr. Haupt, the importance of this new type bridge system rests in two facts. It makes possible substantial savings in steel and foundations. And it serves modern high-speed traffic better than conventional types by automatically separating opposing lanes of vehicles and by eliminating the outer lines of framework, which ordinarily appear to motorists as obstructions to vision.

As shown in the accompanying illustrations, bridges with this new type of cross section have been projected in several truss arrangements, and as arches and as suspension spans. One scheme, not shown, involved a double-deck arrangement for one of the truss-type designs.

The first "middle support" bridge is scheduled for construction next year across the Ostertal River in the southwestern part (French Zone) of Germany. Of 330-ft. span, it will be of the design and dimensions shown in the center of the top row of drawings on the opposite page.

Particular care is exercised in the design of middle-support bridges to provide high torsional resistance, and it is claimed that the factors of safety against wind and against traffic loads unbalanced on one side can be made amply large. The three-chord triangular-shaped truss is particularly efficient in this respect.

From a side view, the middle-support bridge appears only slightly different than a conventional bridge. However, as Mr. Haupt says, "it works more quietly because over the roadway there is only one chief support, which in an oblique view does not look any different than a rod."

The new bridge is being developed first in steel, although studies are said to have shown that reinforced concrete designs are equally practicable. It can be used for railway as well as highway bridges.

DECK VIEW of a middle support bridge, suggested for a Rhine crossing near Coblenz, as sketched by a German artist.

Pumping Sewage Automatically

C. E. Keefer
Deputy Sewerage Engineer, Bureau of Sewers
Baltimore, Md.

LATEST APPLICATION of automatic and supervisory control devices to improve service and minimize the need for operating personnel in a pumping plant is to be seen in the Dundalk sewage station at Baltimore. A 29-mgd. installation—one of the largest of its kind—has been designed to carry on its functions unattended, with the exception of a daily visit by a maintenance man.

Control mechanisms are connected to alarms in the Eastern Avenue pumping station—an existing plant that cannot handle the steadily increasing sewage load from a 6.74-sq. mi. low-lying area adjacent to the harbor—by a pair of underground telephone cables. The alarm sounds and warns operators when the following hazards develop at the Dundalk station: Low vacuum in the pump-priming system, low oil pressure in the accumulator tank, low pressure in water-seal piping to sewage pumps, low or high sewage level in the suction well, electric power failure, and high water in the sump-pump pit.

Under normal operation, the alarm circuit is closed. When the circuit opens, the alarm sounds. This design has the advantage of indicating when the circuit is out of order.

Ultimate capacity is 49 mgd.

With provision for future installation of two 14,000-gpm. pumps, the Dundalk station includes an 8,000- and a 12,000-gpm. unit. The four pumps will provide an ultimate capacity of 49 mgd. to serve an estimated population of 164,000 in 1990.

Sewage is discharged through a 4,000-ft., 36-in. cast-iron force main to the outfall that conveys the major part of the sewage by gravity from the city to the Back River treatment plant.

The Dundalk station is a one-story building, about 58 ft. square, with ground and basement floors. The interior is finished with hard-burned, red-shale brick.

The substructure is built of heavily reinforced concrete, waterproofed on the exterior with five-ply, coal-tar-pitch membrane. This membrane is held in place and protected from damage on vertical walls, by a brick-masonry facing, 4½ in. thick.

The ground floor contains a gallery immediately above the pump room, a transformer and electric switch-gear room, a small office and a storeroom. The basement floor consists of a screen and suction well, pump room and auxiliary-equipment chamber.

Sewage is screened

Entering the pumping station through a 5.5x3-ft. collector, 19.35 ft. below mean low tide, sewage flows through an open channel, 8 ft. wide and 9½ ft. deep, containing a mechanically cleaned screen. Stop-plank grooves in channel walls ahead of the screen permit diversion of sewage and access to the suction well. In each side wall 3-ft. weirs, 1.0 ft. above maximum sewage level in the suction well, accommodate bypass flow when the screen clogs.

The screen consists of a series of ¾-in. round steel bars with ¾-in. clear openings set at 60 deg. to the horizontal. On the downstream side of the screen and projecting through the bars are seven rakes, the ends of which are attached to endless chains.

Lifted by the rakes, screenings are dumped into a watertight metal hopper, from which they are conveyed on a 12-in. rubber belt to a 2-100 rpm. grinder driven by an electric motor. Ground material is discharged into the sewage downstream from the screen.

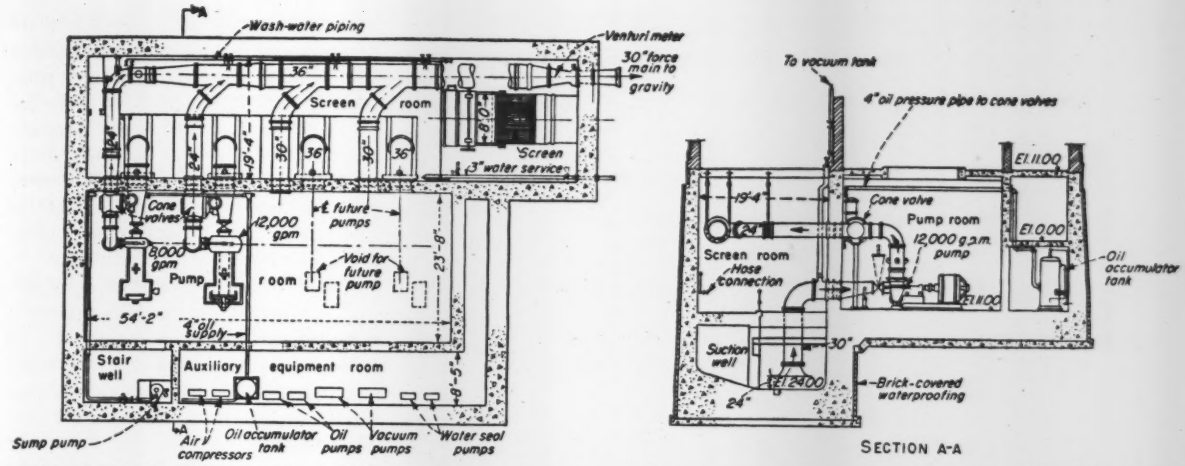
The screen and grinder are actu-

ENGINEERING DATA FOR DUNDALK SEWAGE PUMPING STATION

Contributory area (53% in Baltimore County)	6.74 sq. mi.
Ultimate population to be served (1990)	164,000
Pumping capacity (one pump out of service):	
Present	11.5 mgd.
Ultimate	49.0 mgd.
Centrifugal pumps:	
Present	1- 8,000 gpm.
	1-12,000 gpm.
Future	2-14,000 gpm.
Head:	
Static	79 ft.
Friction	26 ft.
Total	105 ft.

Screen: One mechanically cleaned unit, 8 ft. wide.
Screening Disposal: Grinding and return to flow.
Suction-Well Ventilation: 30-in. duct with 4,700-cfm. fan; 24-in. outlet duct with exhaust siphon ventilator at top.
Heating: Nine thermostatically controlled electric unit heaters with a total rating of 41 kw.
Force Main: A 36-in. 4,000 ft. cast-iron pipe, connecting with gravity outfall that discharges at Back River treatment plant.

Cost:	
Building	$182,384
Mechanical and electrical equipment	128,301
Total	$310,685



WITH THE SUCTION WELL SEPARATED from the pump and auxiliary equipment rooms by a solid wall, electric motors and control devices are protected from damage by flooding. The well is entered from the outside by stairway.

ated manually or by an electric motor controlled by an automatic timer. The adjustable timer provides daily operation periods varying from 3 min. to 24 hr. or shutdowns of 20-min. to 23 hr. and 57-min. The grinder and belt are flushed with water admitted through a solenoid-regulated valve.

After passing the screen, sewage flows into the well in which are provided two 30-in. and two 36-in. suction pipes (for future use), a liquid-level tube, a sump-pump outlet and an inspection platform extending the full length of the well.

On 13-ft. centers, the suction pipes terminate in bell-mouth fittings set 24 in. above the floor. The liquid-level tube is connected to an air compressor and indicating gage by small-diameter tubing. Hose outlets for flushing are provided at convenient locations along the inspection platform.

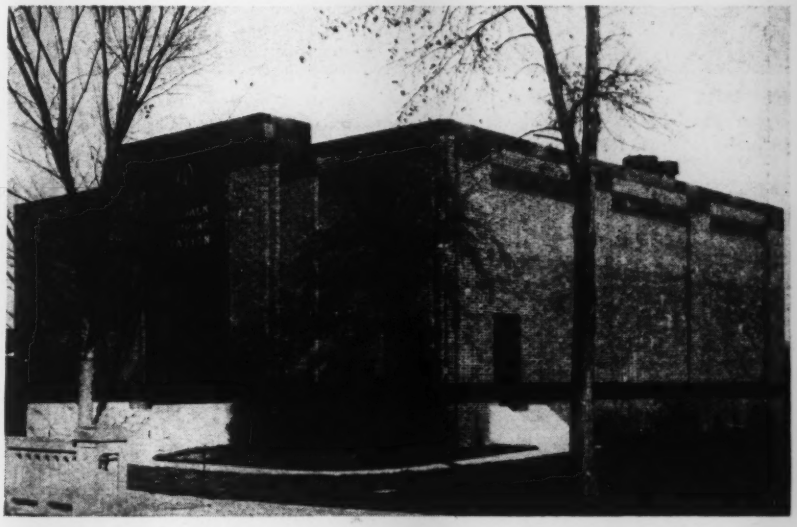
All electrical equipment in the screen and suction well is explosion-proof.

Pump characteristics

Sewage is lifted from the suction well through 30-in. risers by two slow-speed centrifugal pumps designed to operate against a 105-ft. head. Characteristics of the end-suction pumps are:

Capacity gpm.	Motor hp.	Speed rpm.	Efficiency percent
8,000	300	702	80
12,000	450	585	80

Each individual pump is driven by a 2,400-v. rotor-wound motor so that the capacity can be decreased by speed reduction.



OF BOMB-RESISTANT CONSTRUCTION, the Dundalk station has brick walls 16 to 20 in. thick and is trimmed with terra cotta.

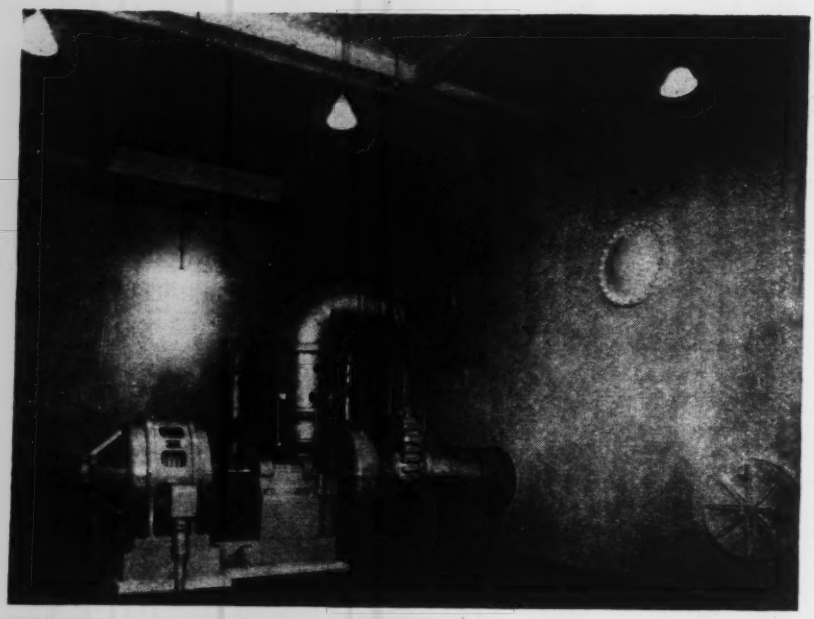
Slow-speed pumps were installed to insure long-life and large passageways were provided to minimize clogging. The cast-iron impeller of each unit contains 2 percent nickel and 0.2 percent chromium to improve wearing quality and is equipped with flat bronze wearing rings.

Operation of sewage pumps is controlled by float switches. The 8,000-gpm. pump goes into operation first at its slowest speed. If sewage in the suction well rises, the speed is increased automatically until maximum output is reached. When sewage continues to rise, the pump is shut down and the 12,000-gpm. unit comes into service. In event of insufficient vacuum in the suction pipes or a low level in the suction well, the pumps are shut down automatically to prevent them from running without liquid.

Vacuum priming provided

Since the horizontal centerlines of the pumps are 7.92 and 9 ft. above maximum sewage level in the suction well, two 47-cfm. vacuum pumps are provided for priming. Priming pumps are connected to the suction of each sewage pump through a piping system containing a 29.4-cu.ft. vacuum storage tank.

Priming facilities are controlled by four automatic switches. The first operates one vacuum pump and maintains the prime on each sewage pump; the second governs the other vacuum pump that comes into service when



REPAIRS to the 8,000 and 12,000-gpm. pumps are made with an overhead crane that operates through an opening in the gallery floor. Capped openings into the suction well are provided for future pumps.

WATER-SEAL, vacuum and oil pumps, an oil tank and air compressors in the auxiliary-equipment are conveniently located for maintenance and repair.

the vacuum drops below normal; the third shuts off the pumps at a predetermined high vacuum, and the fourth switch sounds an alarm in the Eastern Avenue pumping station when the vacuum is dangerously low.

Sewage is discharged through 24-in. pipes fitted with 24-in. cone valves operated by oil-pressure. The valves are pipe-connected to an accumulator tank where oil pressures is maintained by two 12-gpm. oil pumps and two 3-cfm. air compressors.

The accumulator tank contains an upper compartment for storage of oil under pressure and a lower chamber into which drains released oil from cone valves. Oil is pumped from the lower reservoir to the upper compartment when the level in the latter drops to a predetermined point. Air pressure varying from 108 to 133 psi. in the upper compartment is maintained by the compressors.

The oil-accumulator tank has sufficient capacity to open and close a cone valve four times before an oil pump or air compressor must operate.

Discharge pipes from the sewage pumps are connected to a 42-in. cast-iron manifold suspended from the suction-well ceiling. At the end of the manifold a 42x20-in. Venturi tube measures pump output varying from 4 to 52 mgd.

Piezometer openings into the Venturi tube are cleaned by six hydraulically operated bronze vent-cleaner valves. As these valves are actuated simultaneously by a four-way water cock, cleaning is an easy operation.

The Venturi tube discharges into the 36-in. force main that connects with the outfall sewer from the city. Fittings in the main will permit construction of a parallel pipe to accommodate increased sewage flow. A 24-in. bypass from the force main to a nearby storm drain discharging into Baltimore harbor will be used only during emergencies.

Pumps provide water

To prevent cross-connection with the municipal water supply, two small centrifugal pumps furnish water to sewage-pump stuffing boxes and to the hydraulically operated cleaner valves on the Venturi tube. With capacities of 5 and 9.5 gpm. against a 170-ft. head, the pumps draw from an overhead tank filled through a float valve. One pump rides on the line continuously. If it stops, a pressure switch on the discharge pipe automatically starts the second unit.

Sewage, cold-water and other pipes on which condensation is anticipated are coated with ½-in. plastic insulating compound.

A 75 gpm. sump pump is provided to handle drainage from sewage-pump glands and water used to flush the pump-room floor.

Electric conduits and small piping installed in the floor will serve two

future pumps. Since it was impossible to determine exactly where conduits should terminate at the floor surface, covered recesses were provided at each pump location. Threaded ends of conduits and pipes were allowed to project a few inches into each recess. When a new pump is installed, concrete slabs covering the recesses will be broken out and conduit and pipes extended to terminate at proper points above the floor. The recesses will then be refilled with concrete and the pump located as planned.

To facilitate maintenance and repair of the large pumps, a 15-ton overhead crane is carried above the gallery on rails set on pilasters adjacent to the walls. Manually operated, the crane serves the pumps through an opening in the gallery.

Electrical equipment

The pumping station is served by two independent overhead 13,200-v. power lines that are carried in underground conduits to the transformer room. Sixty jar-type storage batteries, capable of producing 125 v., close and trip the incoming circuit breakers and operate a supervisory alarm circuit.

All necessary electrical equipment —such as high-tension disconnect switches, circuit breakers, a 1,500 kva., air-cooled, 13,200-2,400-v. transformer and control devices for the sewage-pump motors—are provided in the transformer room.

The large sewage-pump motors operate on 2,400 v., while the small motors, all less than 25 hp., are designed for 480-v. service.

A secondary control board is mounted in the wall between the gallery and the transformer room. The board contains the Venturi tube indicator-recorder-register, starting equipment for 480-v. motors, a vacuum gage connected to pump suctions and a liquid-level gage showing elevation of sewage in the suction well.

The station is windowless, and special attention was given to ventilation. To eliminate explosion hazards, the suction well is served by two vertical sheet-metal ducts extending through the roof. The inlet duct, 30 in. in diameter, contains a 4,700-cfm. fan; the 24-in. outlet terminates in an exhaust ventilator above the roof. The fan is capable of changing air in the suction well every seven minutes.

Pump and transformer rooms are also equipped with ventilating ducts that pass through the roof.

Two additional safety devices were installed after the Dundalk station was put into service. One prevents sewage pumps from restarting automatically after a power failure, making it necessary for the operator to start them manually. This safeguard was provided because, after a power failure, backflow would drive the pump and motor in the reverse direction at greater than normal speed before the cone valve would close. If power should be restored during reverse rotation, the motor would be damaged seriously.

The other safety mechanism consists of relays to prevent sewage pumps from operating if the cone valves fail to open. Heat generated by churning sewage would also damage the pumps.

There is always danger of an interruption of electric power, and subsequent flooding, and stand-by facilities are to be provided. Emergency facilities will consist of one or more diesel or gasoline engines direct-connected to a 2,300-v. generator.

The Dundalk sewage pumping station is under the general supervision of P. L. Holland, director of public works. John J. Hunt is sewerage engineer and Robert T. Trautmen is principal associate engineer. Frank O. Heyder served as architect and William Hartman was consulting electrical engineer. As city representative, Malcolm L. Fallin was in charge of the construction.

How To Make Insulating Board From Sawdust and Wood Wastes

Results of research into possible uses of sawdust and other wood wastes indicate the technical feasibility of making insulating boards from such materials, it is reported by the Housing and Home Finance Agency in a paper on "Small-Scale Manufacture of Insulating Boards from Wood Wastes," to be published in HHFA Technical Bulletin No. 5.

The report is one of a series being issued by HHFA to make available to the homebuilding industry in usable form practical results of technical housing research previously sponsored by that Agency at the Forest Products Laboratory, Forest Service, U. S. Department of Agriculture. Technical information in the report is intended for guidance of firms who contemplate operation of a small plant (15 to 25 tons daily capacity) with waste materials supplied by nearby wood-processing plants.

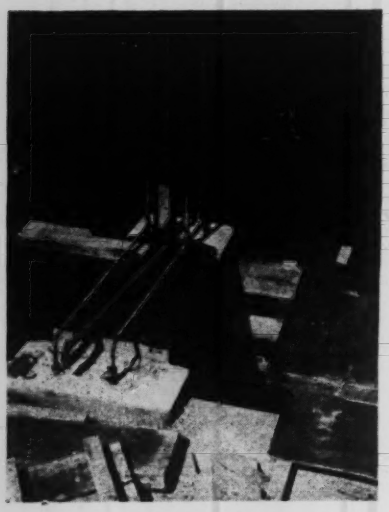
Wastes investigated in tests included sawdust and solid wood-wastes such as slabs and edgings usually burned at sawmills; pulp-mill wastes consisting of a mixture of bark, chipper sawdust, and chip and pulp screenings, and low-density hardwoods, such as aspen, available as wood thinnings and sawmill waste.

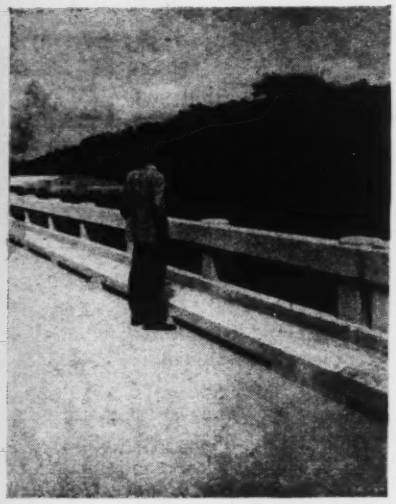
Results of investigations indicate that some insulating boards made from sawdust and chipped solid wood, with hydrated binder pulp, would meet requirements of these tests for all types of insulation boards. Several other materials also appear suitable for one or more types of boards.

"The most promising boards contained at least 15 percent of hydrated binder pulp," the report advises. Satisfactory boards were also made by employing repulped old newspapers as the binder. Processing of waste materials in an attrition mill resulted in boards superior to those made of unprocessed waste materials. Several boards made of unprocessed waste were, however, satisfactory for some types of insulating board when mixed with at least 25 percent of binder pulp when the matted pulp was press-dired.

"Test sheets were made from wood thinnings and from wood waste that accumlates in pulp mills for comparison with the properties of test sheets made from pulps known to be satisfactory for some classes of insulating boards. A few test sheets thus made were found to be comparable in certain strength properties with those made from pulps of established usefulness for the purpose. It is believed that those pulp mixtures can be made into satisfactory roof-insulating boards and roofing felt."

FIELD AND OFFICE





THE 2x6-in. timber supporting the outside edge of the sidewalk forms for a Virginia bridge is suspended from a temporary rod through each bracket (left photo). Completed railing of bridge provides smooth single railing (right photo).

Bridge Formwork Simplified

A simple scheme for erection of sidewalk forms saved the contractor considerable time and money on construction of an 830-ft. deck girder bridge across the Shenandoah River near Luray, Va.

At each side a 30-in. sidewalk is provided and it is supported on concrete brackets spaced about 8 ft. on centers. In constructing the brackets a ½-in. smooth rod somewhat longer than the thickness of the bracket was embedded near the end of this member parallel to the centerline of the bridge. A few hours after the concrete for the bracket had been placed, the rod was driven out.

In erecting the sidewalk form a ⅝-in. rod about 2 ft. long was inserted in this hole and a clamp added at each end. This permitted wire ties to be added between the clamp and the bracket to support a 2x6-in. timber. This member in turn supported the outer end of the 2x4's on which the sidewalk forms were supported. Since an almost continuous opening about 3 in. high is provided through the curb at roadway level, the inner ends of the 2x4's could be supported on the completed roadway slab.

The bridge was built by the Virginia Deparment of Highways. It was designed under the supervision of Wm. R. Glidden, bridge engineer. Construction was supervised by T. F. Loughborough, state construction engineer, and Frank Fawcett, resident engineer.

Echols Bros. Co., Staunton, Va., was the general contractor for the $350,000 project, which totalled 0.9 mi. in length, including the earthfill approaches.

Bridge-Design Problems Solved With Electronic Computer

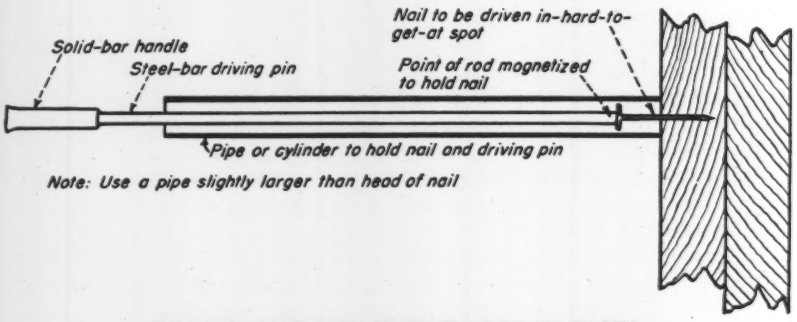
Computations involved in studying the effect of wind on suspension bridges, which formerly took days or weeks to work out by long-hand, now can be solved in a matter of minutes by an electronic analogue computer. The computer is capable of solving differential equations of the twenty-first order and performing automatically complicated operations of integration.

The electronic computer was utilized by D. B. Steinman, consulting engineer, New York, for computing and plotting a series of graphs needed for a paper, "Aerodynamic Theory of Bridge Oscillations," to be published in the ASCE *Proceedings*.

The specific problem was to plot the integrated product of the ordinates of experimental pressure-distribution curves multiplied by sine and cosine functions of variable parameters. The empirical curves were reproduced on functional cams revolving against potentiometers in the servo-mechanism to yield a voltage output proportional to the variable ordinates. The variable multiplying functions were reproduced by feeding into the differential analyzer a simple second-order differential equation yielding the sine and cosine functions as its solution. The integrated product of the empirical and analytical functions was given directly by the machine.

The sixteen graphs, previously computed by Dr. Steinman by long-hand integration, required sixteen days of calculation, despite all short-cuts utilized. The electronic analogue computer yielded each graph, more accurately, in 45 minutes.

This "electrical brain" was designed and built by the Reeves Instrument Corp. for use by the U. S. Navy and leading aircraft corporations.


Nail to be driven in-hard-to-get-at spot
Solid-bar handle
Steel-bar driving pin
Point of rod magnetized to hold nail
Pipe or cylinder to hold nail and driving pin
Note: Use a pipe slightly larger than head of nail

DRIVING NAILS IN HARD-TO-GET-AT SPOTS

Where reinforcing bars and forms make it difficult to drive nails, a "gun" consisting of a pipe sleeve slightly larger than the nail head and a driving pin inside the sleeve may be used to speed form work.—J. R. CLARK, Richmond, Calif.

CORROSION-PROOF ROOF FOR TROPICAL OIL TANKS

Attacked on the inside by hydrogen-sulfide fumes combined with moist air, metal-plate roofs of petroleum storage tanks last only six to eight years in the tropical-Gulf Coast area (left above). Since replacement is costly and time-consuming. Petroleos Mexicanos' engineers experimented for over a year to develop a more suitable roofing material.

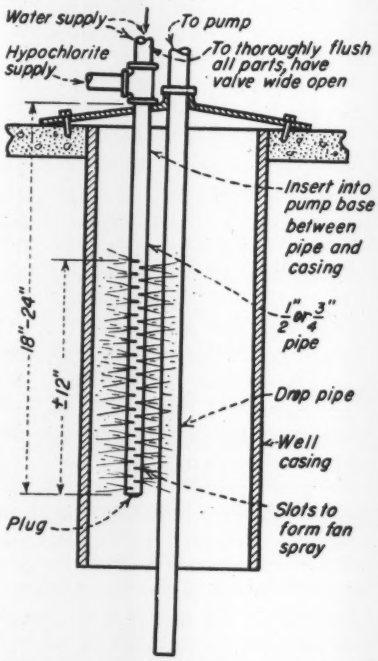
What was wanted was a corrosion-resistant roof that is no heavier than ⅜-in. steel plate, that is rugged enough to support workmen and that can withstand the heat of the tropical sun and frequent showers. The most economical solution was a roofing with a mineral-wool cement base.

As used in an installation (right above) by H. R. Morris, Materiales Aislantes, Monterrey, Mexico, the roof was cast 2 in. thick and reinforced with 12-ga. wire mesh. The new roofing is expected to outlive the metal type by at least four times and is said to cost no more.

How To Chlorinate Wells

Quick, effective well chlorination can be accomplished with an inexpensive injector, a hypochlorinator and an external supply of water.

The injector consists of a ½ or ¾-in. tee and a 2-ft. pipe of the same diameter. Screwed into one of the straight-through outlets of the tee, the pipe is perforated circumferentially with fine slots along the lower half and is plugged at the bottom.



WITH an injector made of a tee and small piping slotted around the lower end, water wells can be sterilized quickly and effectively.

After the water supply has been connected to the other straight-through inlet of the tee and hypochlorinator attached to the third opening, the slotted arm of the injector is put into the well through a capped hole in the pump base.

High-strength hypochlorite and a large volume of water are then supplied to the injector. This mixture is sprayed into the top of the well through the slotted outlet pipe.

One advantage is that all parts of the casing and drop pipe are thoroughly wetted and washed down. The dirty water is pumped to waste through the suction pipe.

Using this device, bacteria-free water has been obtained in as little as two hours of pumping. Conventional well-sterilization procedures may require six to eight weeks of pumping and testing.

Another advantage of the injector is elimination of pumping against high pressure. For this reason, emergency chlorination of wells by the hypochlorinator and injector is now standard practice in Nebraska—T. A. FILIPI, *director, division of sanitation, State Department of Health, Lincoln, Neb.*

Crane-Suspended Current Meters

For several years stream gagers have been taking current-velocity readings above the discharge gates at each lock and dam on the Mississippi River from a suspended platform lowered to the water surface by a crane.

A new and safer method of reading the river velocities has been devised by Henry Harich, of the Corps of Engineers, St. Paul, Minn.

Instead of lowering men on a platform, the meter is suspended in the water from a crane and its cable is run through the load-line sheave.

STREAM gagers lowered on crane-suspended platforms, run the risk of falling in to treacherous currents while measuring current velocities.

READER COMMENT

Engineers As Administrators

Sir: On page 80 of the July 22 issue in "Reader Comment" is a letter from L. C. Bishop and his last sentence is the most interesting one. Too often the engineer who is better fitted to handle an assignment is bypassed with the phrase "we need an administrator for this job."

I have recently seen a bulletin of the Johns-Manville Corp at Manville, N. J., in which was the following: "Due to the large amount of administrative work in the department, it has been found advisable to assign an engineer as G P E D Office Manager. Mr. John H. Dickenshied has been assigned as Office Manager.

D. C. RENTON,
Chief Engineer."

So, more and more, all over the country, it has been found that engineers are not only engineers but can handle the administrative work as well.

T. B. RIGHTS
Consulting Engineer
Roselle, N. J.

Acid-Resisting Compounds

Sir: Your editorial, "Sulphur Joint Compound Research" (*ENR* May 27, vol. p. 766) is a valuable and intelligent comment in the field of acid-resisting compounds.

We discontinued the use of sulphur for acid-resisting cements some years ago, because we found that sulphur in the presence of moisture forms an acid of highly corrosive powers in contact with certain other materials.

What is needed is a strict adherence to the basic laws of chemistry in the manufacture and recommendation of cements or compounds for acid-resisting construction.

Also the word "acid-proof" should be eliminated because no material will resist all acids. Sales optimism and sales quotas help the generalities of business but they have no real place in a field of applied science such as the construction industry when substituted for scientific laws.

There are too many instances today of manufacturers rushing out with an answer to a construction problem merely because the problem offers an opportunity to use up some by-product or waste product, or to sell a supposed answer. Too often sales quotas are used as a salesman's guide by management instead of the hard rules of chemistry and physics.

WILLIAM J. REARDON
President, Reardon Industries
Cincinnati 6, Ohio

Young Engineer's Outlook

Sir: Your editorials (*ENR* June 10, vol. p. 941 and *ENR* Apr. 15, vol. p. 548) lead me to point out the attitude of some senior engineering students, including myself, toward foreign work and secondly, highway jobs.

Many college men are well aware of the living conditions to be expected in far-away places which are not unlike overseas military camps. They picture mess halls, barracks of some sort, recreation halls including phonograph, ping-pong, assorted periodicals from the states, perspiring poker games, and the black cloud of frustration closing in to be partially relieved by numerous cases of Scotch.

It isn't always roses, but foreign work offers two binding incentives—experience and good pay. Naturally, new graduates cannot obtain lucrative positions of interest without that all-essential experience. Why not take a job paying substantially better than the average available while getting that experience? It is tempting to clear $400 a month, (with no place to spend it), wind up with three years experience and start on the first rung of the ladder here at home.

Concerning highway work: Officials may well worry about the future engineering forces in that field. The caliber of men, which is not often outstanding, now will not improve. Military experience has taught ambitious students the evils of civil service and its red tape. Laborers make more than the engineers on the job with 15 years' experience. The greatest evil, however, is politics. Unfortunately, the lower echelons of government, county and state, are prone to the more petty and small-time politics which force an engineer from his true motives of modern, efficient highway construction and administration. Civil service pay is low, frustrates ambition and forces a man toward a complacent "I'm not going to kill myself working" attitude.

At present, I am an instrumentman with state engineers on a parkway construction job. I am getting experience I consider beneficial, but the biggest lesson I am learning is not to go with the state when I graduate next January. Ninety percent of the field and office work can be done by well-trained technicians. There are only one or two real engineers in a staff of 200. The other college degrees on the staff are wasted unless a person is that one in forty who does seep toward a position of district engineer or higher. Chances of this are slim, not because of lack of ability, but because of civil service rules, seniority and politics.

Naturally the picture isn't all black, but unless an engineer is lucky enough to get to the top quickly, he is bound to become caught in the surrounding web and his ambitions, imagination and creativeness as an engineer are stifled.

STUDENT ENGINEER

Although this letter was not submitted for publication, permission to publish it anonymously was obtained from the author because it is believed to reflect sentiments widely held by young civil engineers with respect to employment questions.—EDITORS.

Railroad Engineering

Sir: It is observed with a great deal of interest that one of the editorials in the Aug. 5 issue of *Engineering News-Record* takes note of the 50th Anniversary of the American Railway Engineering Association. As a member of that association I would express appreciation of this recognition given the functioning and achievements of the AREA, as well as of pertinent suggestions for improvement in its activity.

It seems proper, however, to take exception to the statement made in that last paragraph—"No longer is railroad engineering a field of adventure for young men or an outlet for initiative". The fact is that, though not accorded the popular glamor that rightfully belongs to the period that spanned the continent with this vast network of railroads, modern railroad engineering faces problems whose so-

lutions offer just as great opportunity for adventure, require just as much ingenuity, and challenge the interest and initiative quite as keenly. It is true, too, that more than a few well advised young men of engineering training are finding satisfaction in a railroad career.

J. L. GRESSITT
Chief Engineer,
The Pennsylvania Railroad,
Philadelphia, Pa.

Sir: Upon my return from China my attention was almost immediately directed to the editorial in *Engineering News-Record* of Aug. 5, page 63, under the heading, "A Half Century of Service". May I thank whoever wrote this editorial for a very fine statement concerning the work of the American Railway Engineering Association over the past fifty years; but in commending the good points in the editorial I wish to state very positively that I think it unfortunate indeed that the statement is made in the editorial that "No longer is railroad engineering a field of adventure for young men or an outlet for initiative".

In the work of the AREA Committee on Cooperative Relations with the Universities we have been trying our best to stress the fact that railway engineering is a field for young engineers and personally I have throughout the country in many of the meetings that I have had with the student chapters of the American Society of Civil Engineers had a good deal to say about the challenge in railway engineering work for young men coming out of our engineering institutions in these days that are right here with us.

I am wondering if in the future publications of *Engineering News-Record* you would write something that would take a little of the sting out of that one sentence.

E. M. HASTINGS
Chief Engineer, Richmond,
Fredericksburg and Potomac Railroad Co.
Richmond, Va.

When separated from the context, the sentence referred to by Mr. Gressitt and Mr. Hastings takes on a quite different meaning from what we intended when writing the editorial. The idea we intended to convey was that, due to changed conditions, railroad engineering *does not have the appeal* for young engineers that it had a half century ago.

As observed by Mr. Gressitt, and as stated subsequently in the editorial under discussion, railroad engineering still provides many opportunities for the application of initiative. There also are opportunities for pioneering, but they are of a less spectacular nature than the pioneering of the great railroad-building days when the AREA was founded.—EDITORS.

Need for Highway Turnouts

Sir: It was with considerable pleasure that I read the article "North Carolina Builds Highway Turnouts" (*ENR* April 29, vol. p. 633).

In the past several years, I have attempted to interest several highway and parkway engineers in the value of constructing paved or stabilized shoulder turnouts at frequent intervals on those roads and parkways which had been constructed with narrow or inadequate shoulders.

An 8 to 10-ft. shoulder width is inadequate for today's speeds, vehicle width and driver habits. An absolute minimum width of 12 ft. should be used for strictly passenger traffic, with a minimum of 15 ft. for mixed traffic. A few figures may illustrate the basis for my opinion.

Almost every passenger car of so-called standard size manufactured today in the United States exceeds 72 in. in width. With side ventilators open or with deluxe equipment bumper ends, many car widths today approach 80 in. A conservative average width would be 6 ft., 3 in.

A motorist driving along determines that he has a flat tire and pulls to the side of the road. If a guard rail or bridge abutment happens to be at the edge of the shoulder, the driver will undoubtedly park at least two feet and perhaps as much as four or five feet from the right-hand edge of the shoulder. Let us assume that a conservative average is only three feet. If the flat tire is on the left-hand side, the motorist will need a minimum working space of three and perhaps as much as five feet. Hence if the motorist is to work clear of the main pavement area he will need about 12 ft.

Actually, a desirable minimum width would be nearer 15 ft. because motorists driving past the stalled car at any speeds above 15 to 20 m.p.h. will shy away some 5 to 15 ft., with the result that a normal two-lane pavement will be reduced to single-lane operation. If traffic pressure is sufficient to prevent single-lane operation, travel speeds will drop suddenly between 10 to 30 mph. which definitely is not conducive to safety or indicative of good highway design.

Similarly, for mixed traffic, it can be shown that 15 ft. should be the absolute minimum, while a desirable minimum would more nearly approach 18 to 20 ft.

Some of the advantages that come to mind, in addition to those cited in the article, are that drivers are more apt to stop completely off of the main pavement and out of the way of moving traffic, that parking of vehicles can be encouraged where there is good sight distance with a resultant lowering of the number of accidents due to the parking and unparking of vehicles, and that shoulder maintenance should be reduced because drivers will be attracted to the turnouts in preference to stopping just any place. This latter point is especially true in the spring when the shoulders are wet or muddy.

HERBERT J. KLAR
Lynbrook, N. Y.

Correction

Sir: In your review of the Blakeley-Endesby paper (ENR June 10, vol. p. 90), the work is ascribed to the Prado Dam. This is an error; the work was done on the diversion dam of the Santa Ana Valley Irrigation Company several miles downstream. The latter dam is, properly speaking, a flood dike, and the escape of water was through the river bank underneath it. It should be made clear that no construction failure of the dam in regard to shutting off this water was involved, since no cutoff wall had been placed and there had been no intention of salvaging the water prior to the development of a process economically justified under the conditions.

The form of the review ascribing the work to the Prado Dam might be interpreted as casting reflections on the design or construction of said dam, which was not in question at all.

V. A. ENDERSBY
Civil Engineer
Shell Development Co.
Emeryville, Calif.

BOOK REVIEWS

Central Valley Project

THEY WOULD RULE THE VALLEY—by Sheridan Downey, United States Senator from California. 256 pp. Publishers Service, P. O. Box 786, San Francisco. $5.

Documented evidence to show that the 160-acre limitation of the Reclamation Act is impractical in California's Central Valley project is the primary theme in this book that presents an exposé of propaganda carried on by a governmental bureaucracy. Based on years of on-the-spot study of farming conditions in California, the author reviews evidence and data bearing on policies of the Department of the Interior and the Bureau of Reclamation as carried out under the Roosevelt administration. He explains how capable engineers have been deliberately replaced by "politicians and propagandists with a corresponding decay of standards and professional competence". He flatly states that political power of controlling officials rather than any ideal of serving the interests of irrigation development has become the objective of governmental agencies involved. Political advantage for the administration has been secured, Mr. Downey states, by developing a government-owned power network, and the interest of the bureau now is chiefly concerned with furthering this gain with only a false and pretended concern for the individual farmer.

Unusual frankness appear in details given about the resignation of H. W. Bashore as Commissioner of Reclamation after being literally deprived of control of his own office; how Henry Wallace, then Secretary of Agriculture, interferred with Senate procedure to get a partisan bill through; and of the scheming that put men with no engineering training into offices formerly held only by engineers. Mr. Downey gives the names of the men whom he characterizes as "arrogant pretenders" as well as those of many engineers to whom he gives credit for attempting to keep politics out of the activities of the Bureau of Reclamation. In fact, the author has carefully documented his entire text.

The real danger in this whole situation, Mr. Downey states, which goes deeper even than the future of California's Central Valley, is "the menace of unbridled bureaucracy—the usurpation of power by a wealthy and unscrupulous federal agency" in which policies are molded by "the overweening ambitions of politicians and propagandists playing at being engineers and administrators".

Engineering Small Houses

STRENGTH OF HOUSES—By Herbert L. Whittemore, John B. Cotter, Ambrose H. Stang and Vincent B. Phelan. 132 pp. Building Materials and Structures Report 109, National Bureau of Standards. Superintendent of Documents, Washington, D. C. $1.50.

STRUCTURAL REQUIREMENTS FOR HOUSES—By F. G. Thomas. 9 pp. National Building Studies, Special Report No. 1, H. M. Stationary Offices, London, England. $0.25.

In both Great Britain and the United States, extensive investigations have been under way to permit more scientific structural design of houses and these two publications make available some of the more important results. Both provide data on occupancy, wind and snow loads. "Strength of Houses," in addition, develops in detail methods for computing the distribution of these forces to component structural elements. Application of engineering principles to the structural design of small houses is expected to promote the use of new materials and unconventional methods of construction.

Miscellaneous Notes on Booklets and Reprints

A TABLE OF COEFFICIENTS for Obtaining the First Dervative Without Differences has been prepared by the National Bureau of Standards and is known as Applied Mathematics Series 2. Copies can be obtained from the Superintendent of Documents, Washington 25, D. C., for 15 cents.

THE 1947 SUPPLEMENTS to the ASTM Book of Standards are now available. They are Part I-A on metals, Part I-B on non-ferrous metals, Part II on non-metallic materials (constructional), Part III-A on non-metallic materials, (petroleum products, soaps and detergents), Part III-B on non-metallic materials (electrical insulating materials, plastics, rubber, and paper products). Single parts can be obtained from the American Society for Testing Materials, 1916, Race St., Philadelphia 3, Pa. for $4.

HIGHWAY LEGISLATION relating to planning, toll roads and superhighways, parking, highway construction and maintenance, and highway finance is summarized in Law Bulletin, Vol. No. 3, Highways, National Highway Users Conference, 938 National Press Building, Washington 4, D. C.

New Engineering Books

THE CHEMISTRY OF PORTLAND CEMENT—By Robert Herman Bogue. 572 pp. Reinhold Publishing Corp., New York. $10.

GENERAL AND APPLIED CHEMISTRY—First Edition—By Arnold J. Currier and Arthur Rose. 275 pp. McGraw-Hill Book Co., New York 18, and London. $3.

PROCEEDINGS OF THE FORTY-SEVENTH ANNUAL CONVENTION OF THE AMERICAN RAILWAY ENGINEERING ASSOCIATION—Vol. 49—American Railway Engineering Association, 59 East Van Buren Street, Chicago, Ill. 851 pp. $8.

1948 MUNICIPAL YEAR BOOK—Edited by C. E. Ridley, O. F. Nolting and F. C. Peitzsch. 558 pp. The International City Managers' Association, 1313 E. 60th St., Chicago, Ill. $9. ($8.50 if remittance accompanies order).

PROCEEDINGS OF THE FIRST NATIONAL MEETING FOREST PRODUCTS RESEARCH SOCIETY—Vol. 1—Forest Products Research Society, Box 2010, University Station, Madison 5, Wis. 344 pp. $6.

THIRD CONGRESS OF THE INTERNATIONAL ASSOCIATION FOR BRIDGE AND STRUCTURAL ENGINEERING—Preliminary publication of papers to be presented at Liege, Belgium, Sept. 13-18. Papers in French, German or English with summary in the other two languages. Copies can be obtained from Prof. F. Stussi, Swiss Federal Institute of Technology, Zurich, Switzerland.

(*Continued on p* 134)

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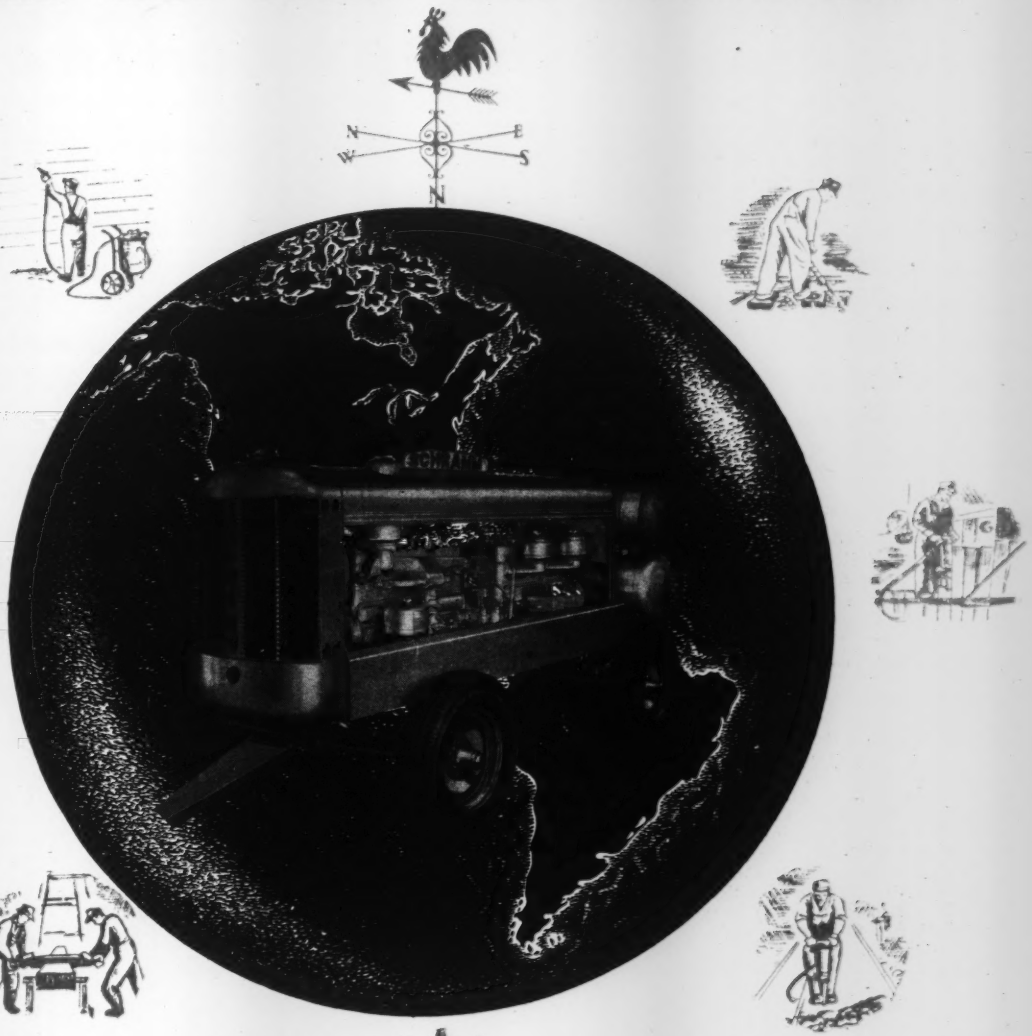

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UNIT PRICES BID BY CONTRACTOR

Relocation of Railroad, Nebr. and Kan.

OWNER: Corps of Engineers, Department of the Army, Kansas City District, Mo.; Col. Paul D. Berrigan, District Engineer.

PROJECT: Relocation of the C. B. & Q. Railroad, Oberlin Branch. The work will include removal of approximately 15.6 miles of existing railroad track and related facilities and construction of 12.41 miles of new track, roadbed, and necessary additional facilities.

CONDITIONS: Owner will furnish all required of relayer rail; angle bars; tie posts, braces and collars for relocating fence; timber and piling for pile trestle approaches; timber fenders, sleepers and sheeting for bridges and pile trestle approaches; precast of truss bridge span, through plate girder bridge span, and deck plate girder span (exclusive of bolts, pins and rivets). Stipulated contract time is 350 days. Access to the job site is available by railroad and highway. Prevailing hourly wage rates are: skilled, $1.25 to $2.00; semi-skilled, $0.90 to $1.25; common, $0.90.

LIST OF BIDDERS: *Contract awarded June 28, 1948

1. *Missouri Valley Constr. Co., Omaha, Nebr. — $938,067.60
2. M. E. Gillioz, Monett, Mo. — 955,183.00
3. Grosshans & Petersen, Inc., Marysville, Kan. — 1,050,803.65
4. Abel Constr. Co., Lincoln, Nebr. — 1,073,233.20
5. Foley Bros., Inc., St. Paul, Minn. — 1,084,913.80
6. Bushman Constr. Co., Kansas City, Mo. — 1,129,401.00
7. R. B. Potashnick, Cape Girardeau, Mo. — 1,137,365.56
8. Western Contracting Corp., Sioux City, Iowa — 1,169,572.00
9. Gould & Cross, Grand Rapids, Mich. — 1,182,821.70
10. Condon-Cunningham Co., Omaha, Nebr. — 1,187,705.00
11. Sebastian B. Albergo & Sons, Chicago, Ill. — 1,203,729.20
12. The Deckert Corp. Chicago, Ill. and Ace Constr. Co. Omaha, Nebr. — 1,232,499.04
13. J. A. Terteling & Sons, Inc., Boise, Idaho — 1,316,399.40
14. S. J. Groves & Sons Co., Minneapolis, Minn. — 1,321,183.55
15. Gibbons & Reed Co., Salt Lake City, Utah and Mark C. Walker & Son Co., Santa Ana, Calif. — 1,342,348.80
16. The Hinman Bros. Constr. Co., Fort Collins, Colo. and Clifford C. Bong & Co., Arcadia, Calif. — 1,385,769.86

	Item		Unit Prices: Government estimate	(1)*	(2)
1	Clearing and Grubbing	lump sum	$1,863.08	$3,000.00	$8,000.00
2	Unclassified Excavation	1,348,500 cy	.294	.313	.32
3	Unclassified Culvert Excavation	4,900 cy	2.353	3.20	4.00
4	Water Furnished	10,000 gal	2.70	3.60	.50
5	Rolling for Additional Two Trips	70,000 sq	.018	.05	.05
6	Concrete	3,000 cy	40.23	40.00	47.00
7	Steel, Reinforcement	239,000 lb	.107	.11	.10
8	22" x 13" Corrugated Metal Pipe, Arch	124 lf	3.32	3.90	5.00
9	29" x 18" Corrugated Metal Pipe, Arch	108 lf	5.88	6.30	7.00
10	18" Corrugated Metal Pipe, Circular	32 lf	3.17	3.80	4.00
11	30" Corrugated Metal Pipe, Circular	66 lf	7.18	11.00	9.00
12	48" Corrugated Metal Pipe, Circular	136 lf	17.59	17.00	16.00
13	24" x 27" Reinforced Conc. Culv. Pipe	984 lf	1.97	2.50	2.50
14	56" x 40" Reinf. Conc. Culv. Pipe	1,056 lf	2.40	3.10	3.00
15	48" x 52½" Reinf. Conc. Cul. Pipe	584 lf	2.81	4.10	3.00
16	60" x 65" Reinforced Conc. Culv. Pipe	102 lf	5.01	5.50	5.00
17	68" x 74" Reinforced Conc. Culv. Pipe	408 lf	5.61	6.00	6.00
18	24" Cast Iron Pipe	60 lf	5.05	6.00	3.00
19	Track Laying and Surfacing	64,203 lf	1.055	1.75	2.00
20	Track on Open Deck Bridges	627 lf	.70	1.75	2.00
21	Inner Guardrail on Bridges	927 lf	.63	1.00	1.00
22	Crossing Plank	lump sum	6,507.33	2,750.00	5,000.00
23	Motor Car Set-Offs	32 ea	107.74	85.00	175.00
24	Right-of-way Fence, Type A	127,600 lf	.231	.18	.25
25	Fence Gates	22 ea	98.84	55.00	50.00
26	Mile Post Markers	12 ea	18.26	40.00	50.00
27	Whistle Posts	19 ea	21.07	40.00	50.00
28	Highway Crossing Signs	11 ea	54.35	60.00	100.00
29	Approach Signs	23 ea	22.23	40.00	50.00
30	County Line Post	1 ea	19.47	40.00	50.00
31	State Line Post	1 ea	19.47	40.00	50.00
32	Driving Piling	5,800 lf	1.792	2.50	3.00
33	Timber Constr., Bridge, Mile 4.08	lump sum	11,372.23	5,000.00	11,000.00
34	Timber Constr., Bridge, Mile 4.75	lump sum	4,507.13	3,000.00	6,500.00
35	Timber Constr., Bridge, Mile 15.09	lump sum	9,378.54	5,000.00	10,000.00
36	Structural Steel, Bridge, Mile 4.08	lump sum	13,785.80	15,000.00	8,000.00
37	Structural Steel, Bridge, Mile 4.75	lump sum	1,465.16	2,000.00	2,000.00
38	Structural Steel, Bridge, Mile 15.09	lump sum	8,165.68	6,000.00	7,500.00
39	Filter Under Riprap	1,650 ton	4.94	7.50	4.00
40	Stone for Riprap	2,450 ton	5.92	8.00	5.00
41	Removing Main Track	78,430 lf	.299	.35	.50
42	Removing Main Track on Open Deck Bridges	3,410 lf	.228	.35	.50
43	Removing Turnouts	2 ea	66.39	200.00	150.00
44	Removal of Existing Bridges	lump sum	65,755.45	35,000.00	...
45	Removing Telegraph Lines	15 mile	113.05	150.00	200.00

Bridges and Approaches, N. J.

OWNER: New Jersey State Highway Commission, Trenton, N. J., Morris Good Kind, engineer.

PROJECT: Construction of bridges and approaches at Lake Avenue, Madison Hill Road, and Westfield Avenue on route 4 parkway in Middlesex and Union Counties. The bridges to have concrete rigid frames with stone facings.

CONDITIONS: All materials to be supplied by the contractor. Access to the job site is available by highway. Stipulated contract time is 125 working days. Prevailing hourly wages are: skilled, $1.25; semi-skilled, $0.75; common, $0.64.

LIST OF BIDDERS: *Contract awarded April 7, 1948

1. *Ole Hansen & Sons Inc., Pleasantville, N. J. — $926,713.27
2. Union Building & Construction Corp., Passaic, N. J. — 1,010,703.52
3. Villa Contracting Co. Inc., Westfield, N. J. — 1,067,060.95
4. Franklin Contracting Co., Newark, N. J. — 1,105,312.50
5. Kolyn Construction Co., Trenton, N. J. — 1,142,739.24
6. Cayuga Construction Corp., New York City, N. Y. — 1,181,939.90

	Item	Quantity	Unit Prices: (1)*	(2)	(3)
1	Field office	1	$1,500.00	$2,500.00	$2,500.00
2	Clearing site	Lump sum	6,200.00	2,500.00	8,500.00
3	Stripping, 9" depth	5 acres	400.00	700.00	550.00
4	Stripping, 12" depth	2 acres	600.00	1,000.00	700.00
5	Roadway excavation—earth	51,150 cy	1.18	.98	1.10
6	Porous fill	4,276 cy	2.25	3.50	2.85
7	Earth excavation for test pits	25 cy	5.00	7.00	10.00
8	Earth excav.—subsurface struc	25 cy	3.00	6.00	6.00
9	Subbase	2,295 cy	2.20	3.25	2.85
10	Stone shoulders, 8" thick	977 sy	1.50	1.20	1.50
11	Topsoiling—4"	19,469 sy	.48	.85	.50
12	Topsoiling—6"	2,239 sy	.50	.85	.55
13	Macadam base course, 4" thick	12,230 sy	1.15	1.10	1.25
14	Mod. pen. mac.—inter. course, 3"	12,230 sy	1.15	.92	1.25
15a	Pavement surface, type "A"	640 tons	12.00	10.50	15.00
15b	Pavement surface, type "T"	640 tons	.....	.....	.....
16	Underdrain, type "F"	200 lf	3.00	3.00	2.00
17	Culvert pipe, 18" R. C.	536 lf	7.80	6.00	6.00
18	Corrug. met. pipe, 18"	74 lf	7.00	6.50	6.50
19	Corrug. metal pipe, 6"	18 lf	3.00	3.50	3.00
20	Manhole	1	3.00	2.50	2.50
21	Manholes, sanitary	3	5.75	7.75	2.00
22	Inlets, type B	2	2.80	3.00	2.75
23	Reconstructed manhole	1	2.00	1.00	1.00
24	White conc. vert. curb, 9" x 20"	232 lf	2.05	2.04	2.50
25	White conc. vert. curb, 9" x 13½"	800 lf	1.85	1.85	2.00
26	White conc. vert. curb, 9" x 20"	1,142 lf	2.05	2.07	2.15
27	White conc. Sloping curb, 10" x 8"	100 lf	1.75	1.75	2.50
28	Concrete sidewalk	291 sy	3.50	3.50	3.60
29	Class C concrete, steps	3 cy	70.00	65.00	75.00
30	Wire rope fence	760 lf	3.00	2.92	2.75
31	Guard fence posts	50	10.00	10.00	9.50
32	Rough cut timber guard rail	206 lf	9.00	9.00	9.00
33	Rough cut timber guard rail	430 lf	12.25	12.00	11.50
34	Broken stone or washed gravel	2 cy	10.00	5.00	5.00
35	Prep. of existing soil	3 acres	3.00	4.25	4.00
36	Trimming exist. trees, 6"	50 caliper	6.00	7.00	4.00
37	Trimming exist. trees, 12"	12 caliper	12.00	15.00	6.50
38	Trimming exist. trees, 20"	12 caliper	20.00	20.00	10.00
39	Trimming exist. trees, 36"	1 caliper	75.00	40.00	30.00
40	Fertilizing and seeding	14,520 sy	.075	.09	.15
41	Topsoil	50 cy	3.00	3.50	2.50
42	Peat humus	59 tons	20.00	11.50	20.00
43	Wrought iron pipe conduit, 2½"	945 lf	2.10	3.25	2.50
44	Sanitary manhole, 4½' diameter	1	7.00	5.00	2.75
45	Special manhole, sanitary	1	225.00	450.00	275.00
46	Vit. clay pipe, 8"	560 lf	15.00	5.50	7.00
47	C. I. water pipe, 8"	202 lf	10.00	6.00	7.50
48	Foundation excavation	4,650 cy	2.75	10.00	3.50
49	Broken stone or bank-run grav	48 cy	10.00	5.00	5.00
50	Corrug. perf. metal pipe, 8"	1,045 cy	4.00	3.30	3.50

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Bridges and Approaches, N. J.

Continued from page 98

51	Corrug. metal pipe, 12"	840 cy	4.70	4.00	4.00
52	Random ashlar masonry	723 cy	123.00	200.00	175.00
53	Dimension masonry	199 cy	282.00	330.00	325.00
54	Blue stone cap stone	53 cy	382.00	500.00	400.00
55	Metal railing—type C	998 lf	10.00	13.00	18.00
56	Class B conc. in structures	4,082 cy	59.00	50.00	64.50
57	Class C conc. in structures	462 cy	34.20	36.50	48.00
58	Class D conc. in structures	4,162 cy	35.00	36.50	50.00
59	Concrete base course	1,521 sy	5.50	11.00	6.00
60	Concrete surface pavement	570 sy	7.50	8.50	6.00
61	Rein. steel in structures	689,400 lbs.	.10	.13	.13
62	Waterproofing, inc. protec	44,645 sf	1.25	.80	.65
63	Elec. work at Lake Ave. bridge	Lump sum	4,785.00	5,000.00	2,500.00
64	Elec. work at Madison Hill Rd. bridge	Lump sum	3,800.00	4,500.00	2,500.00
65	Elec. work at Westfield Ave. bridge	Lump sum	3,800.00	4,500.00	2,500.00
66	Steel pipe for gas line, 8"	162 lf	5.75	6.50	6.00
67	Field office	Lump sum	2,000.00	2,500.00	2,000.00

Sanitary Sewers, Seattle, Washington

OWNER: City of Seattle, Washington; R. W. Finke, city engineer.

PROJECT: Construction of 8,050 feet of 8-18 inch sanitary sewer located at 36 Avenue South West in Seattle, Washington. Includes 75 cubic yards extra excavation and installation of side sewer connections, manholes and catchbasins.

CONDITIONS: All materials to be furnished by the contractor. Stipulated contract time is 90 days. Access to the job site is available by highway only. Prevailing hourly wage rates are: skilled, $2.50; semi-skilled, $2.00; common, $1.70.

LIST OF BIDDERS: *Contract awarded June 10, 1948

1. *Valley Constr. Co., Seattle, Wash. $50,138
2. Superior Constr. Co., Seattle, Wash. 50,682
3. Queen City Constr. Co., Seattle, Wash. 51,448
4. A. Ioffredo, Seattle, Wash. 52,114
5. Thos. Scalzo, Seattle, Wash. 52,473
6. Statesside, Constr. Co., Seattle, Wash. 54,834
7. Joe Coluccio, Seattle, Wash. 56,378
8. Malaspina & Natoli Co., Seattle, Wash. 56,602

			Unit Prices		
	Item	Quantity	(1)*	(2)	(3)
1	Pipe sewer, 18-in	890 lf	$3.98	$5.95	$4.10
2	Pipe sewer, 15-in	330 lf	3.65	5.20	3.50
3	Pipe sewer, 12-in	465 lf	3.22	3.40	3.20
4	Pipe sewer, 10-in	270 lf	2.99	3.00	3.15
5	Pipe sewer, 8-in	6,095 lf	2.87	2.55	2.90
6	Side sewer connections, 6-in	500 lf	2.22	2.75	2.00
7	Manholes	36 ea	175.00	170.00	175.00
8	Catch basins, 1 inlet	12 ea	175.00	195.00	175.00
9	Catch basins, 2 inlets	11 ea	220.00	240.00	200.00
10	Catch basins, large inlet top	8 ea	170.00	180.00	200.00
11	Gravel in place, except in roadway	75 cy	4.00	4.00	3.00
12	Extra excavation	75 cy	2.00	3.50	1.00
13	Crushed stone surfacing	2,550 tons	3.00	2.75	3.50

Industrial Sewer, Modesto, California

OWNER: City of Modesto, California; Frank Rossi, city engineer; Harry N. Jenks, Palo Alto, consulting engineer.

PROJECT: Construction of an industrial sewer in Modesto, California including installation of settling and oxidation ponds, percolation beds, screen structures, 2" to 12" steel pipe lines, 15" to 60" reinforced concrete sewer pipe lines.

CONDITIONS: All materials to be furnished by the contractor. Access to the job site is available by rail and highway. Stipulated completion date is August 3, 1948. Prevailing hourly wage rates are: skilled, $1.50; semi-skilled, $1.40; common, $1.30.

LIST OF BIDDERS: *Contract awarded May 26, 1948

1. *Stockton Construction Co., Stockton, Calif. $416,136.28
2. L. Biasotti & Son, Stockton, Calif. 426,821.00
3. Hoagland-Findlay Engr. Co., Long Beach, Calif. 448,418.00
4. Franceschi Construction Co., San Francisco, Calif. 457,551.38

			Unit Prices		
	Item	Quantity	(1)*	(2)	(3)
1	Steel pipe in trench—2 in	800 lf	$.33	$.60	$.20
2	Steel pipe in trench—4 in	800 lf	.79	.80	.40
3	Steel pipe in trench—4 in	3,300 lf	.92	1.15	.60
4	Steel pipe in trench—8 in	2,400 lf	1.06	1.67	.75
5	Steel pipe in trench—10 in	100 lf	1.25	2.28	.90
6	Steel pipe in trench—12 in	100 lf	1.19	3.00	1.00
7	Cast iron and steel pipe fittings	13 tons	330.00	240.00	165.00
8	Open-joint concrete sewer pipe—6 in	600 lf	.33	1.05	.15
9	Cement jointed concr. sew. pipe—6 in.	1,000 lf	.53	1.25	.85
10	Fabricate and erect steel pipe—6 in	48 lf	1.32	6.00	65.0
11	Gate valves—2 in	12	3.96	4.80	3.00
12	Gate valves—4 in	2	7.92	30.00	5.00
13	Gate valves—6 in	28	9.24	36.00	8.00
14	Gate valves—8 in	7	9.24	48.00	16.00
15	Gate valves—10 in	2	13.20	50.00	25.00
16	Gate valves—12 in	2	13.20	65.00	33.00
17	Gate valves—4 in	2	7.92	30.00	5.00
18	Gate valves—6 in	2	9.24	36.00	8.00
19	Fire hydrant	1	39.60	125.00	33.00
20	Wharf hydrants—1½ in	6	9.24	28.00	8.00
21	Clayton back siphonage valves—4 in	2	9.90	40.00	42.00
22	Reinf. concrete pipe—15 in	1,000 lf	.79	1.95	1.70
23	Reinf. concrete pipe—18 in	1,200 lf	1.98	2.10	1.85
24	Reinf. concrete pipe—36 in	3,000 lf	2.64	3.92	2.50
25	Reinf. concrete pipe—48 in	2,400 lf	3.30	4.48	5.00
26	Reinf. concrete pipe—60 in	560 lf	6.60	5.04	10.00
27	Connect pump discharge pipe	27	132.00	350.00	500.00
28	Calco sluice gates—18 in	18	26.40	72.00	17.00
29	Calco sluice gates—36 in	20	62.80	90.00	42.00
30	Calco sluice gates—48 in	12	66.00	110.00	83.00
31	Calco sluice gates—60 in	1	132.00	180.00	170.00
32	Cast iron manhole covers and frames	3,000 lbs	.26	.30	.25
33	Struct. steel in stop-plank frames, bolts, etc	2,500 lbs	.33	.25	.40
34	Galv. steel subway grading	1,000 lbs	.44	.40	.75
35	Redwood structural timber	10,000 MBM	297.00	280.00	332.00
36	Douglas structural timber	5,000 MBM	264.00	280.00	317.00
37	Reinf. steel	150 tons	197.24	180.00	240.00
38	Conc. in pumphouse, areators, deck screen struct. flume, control chambers, gate struct., etc.—3,000 PSI	2,000 cy	76.56	65.00	58.00
39	Filter stone—3-6 in	2,500 cy	6.60	7.75	9.00
40	Filter gravel—½-1½ in	600 cy	5.94	4.00	6.40
41	Filter gravel—½-2 in	600 cy	4.62	4.00	4.80
42	Filter gravel—¼-½ in	2,400 cy	3.96	4.00	4.80
43	Excav. for struct. incl. 90% compacted backfill	8,000 cy	1.98	2.00	2.50
44	Trench excav. for struct. incl. 80% compacted backfill	10,000 cy	1.98	.40	.65
45	Trench excav. for struct. incl. 90% compacted backfill	7,000 cy	1.98	.40	1.00
46	Waste excavation	50,000 cy	.21	.20	.22
47	Waste excav. includ. 90% compacted backfill	150,000 cy	.24	.35	.41
48	Waste excav. includ. 80% compacted backfill	250,000 cy	.22	.35	.36
49	Yard overhaul—¼ mile	30,000 cy	.12	.09	.31
50	Labor	500 mn hrs	4.55	4.40	5.00

Airport Improvements, Brainerd, Minn.

OWNER: Brainerd-Crow Wing County Airport Commission, Brainerd, Minn.; C. O. Markson, engineer.

PROJECT: Airport improvements at Brainerd, Minnesota involving three bituminous base runways of 4,000, 3,600 and 3,500 feet respectively and plane parking aprons. Installation of 1098 lin. ft. of underground duct and aircraft tiedowns.

CONDITIONS: All materials to be furnished by the contractor. Access to the job site is available by rail or truck. Stipulated contract time is 55 days.

LIST OF BIDDERS: *Contract awarded May 25, 1948

1. *J. W. Craig Co., Minneapolis, Minn. $95,530.84
2. Alexander Construction Co., Minneapolis, Minn. 100,561.42
3. Herbison Construction Co., Brainerd, Minn. 105,611.96

			Unit Prices		
	Item	Quantity	(1)*	(2)	(3)
1	Bituminous material for base MC 1, 2, or 3	216,200 gal	$ .16	$ .177	$ .158
2	Btuminous material for surf MC 2 or 3	147,740 gal	.16	.167	.156
3	Bituminous stabilized base	134,237 sy	.12	.12	.16
4	Bituminous surface	7,600 cy	1.20	1.35	1.60
5	Graded aggregate	7,600 cy	1.05	1.00	1.50
6	Motor grader	70 hr	8.00	10.50	7.00
7	Bull dozer	40 hr	9.50	10.50	8.00
8	Water	80 M gal	5.00	3.50	4.00
9	Two way underground duct	942 lf	2.00	1.40	1.50
10	Six way underground duct	156 lf	3.00	3.20	4.00
11	Aircraft tiedowns	40 ea	10.00	10.00	5.00

NEW PRODUCTS

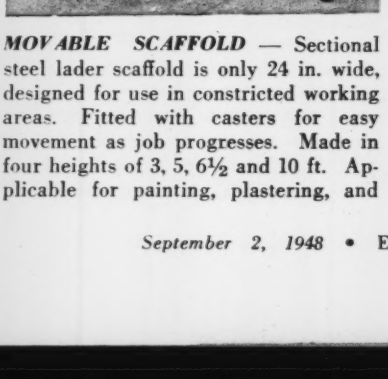
PORTABLE SCREENING AND LOADING PLANT—Designed to handle either gravel or rock from pit, quarry or stockpile when a crusher is not needed, this portable screening and loading plant will produce finished aggregate sizes, travel over any road, and can be reerected quickly. Plant consists of a heavy-duty, double-deck, horizontal vibrating screen, three folding-type channel frame conveyors and an apron feeder with charging hopper and grizzly, all mounted on a pneumatic-tired transport truck. With clutch and power take-off shaft, 40-50 hp. is required. Governor is set at 1,200 rpm. full load.—*Iowa Manufacturing Co., Cedar Rapids, Iowa.*

BLUEPRINT CABINET—Drawings and blueprints hang smoothly, occupy a minimum of space, are indexed and quickly accessible in the Draw-In-Dex cabinet. Accommodating up to 1,000 drawings, the cabinet is 4 ft. high, 2 ft. 6 in. wide, and 20 in. deep. Index cards and lock are standard equipment.—*Empire Development, Corp., 52 Broadway, New York 4, N. Y.*

CLEVIS GRAB HOOK—Available in sizes from ¼ in. to ⅝ in., a clevis grab hook is attached by slipping the clevis pin into place, spreading the cotter. No additional fittings of any kind are needed. All parts are drop-forged and heat-treated. A housing covers the end of the clevis pin, preventing the cotter from catching in workers' clothing or scratching their hands. — *Thomas Laughlin Co., Portland 6, Me.*

PORTABLE POWER HACK SAW—A patented sawing action eliminating use of weight and a work-holding vise (capacity 3x3 in.) are features of Hand-I-Hack, a light weight portable power hack saw. Operated on 110 v., a.c., sawing can be done in any position. Vise is swivel-mounted and calibrated for mitre cutting.—*Lipe-Rollway Corp., Syracuse, N. Y.*

PAINT SPRAY GUN—More uniform air flow makes possible a smoother, higher-gloss finish with the Micro-Spray paint gun. Among its features are a single fluid needle for all spraying, good balance, easy removal and assembly of parts, and three spray heads covering the full range of paint spray materials. —*American Brake Shoe Co., Kellogg Division, Rochester, N. Y.*



MOVABLE SCAFFOLD — Sectional steel lader scaffold is only 24 in. wide, designed for use in constricted working areas. Fitted with casters for easy movement as job progresses. Made in four heights of 3, 5, 6½ and 10 ft. Applicable for painting, plastering, and general maintenance operations.—*Patent Scaffolding Co., Inc., 38-21 Twelfth St., L. I. City, N. Y.*

LUMINOUS LIGHTING SYSTEM — High levels of illumination with elimination of glare are provided by Sky-Glo, a new lighting system of translucent louvers. Installation is adaptable to almost any shape or size of room, and economical in installation and maintenance. Louvers are translucent and do not alter the color of the light.—*Benjamin Electric Mfg. Co., Desplaines, Ill.*

SURVEYING ALTIMETER — With a range of 2000 ft., the new W&T precision altimeter will determine elevations accurately in one-tenth the time required by vertical angle or spirit leveling. It is a sensitive instrument, yet designed to withstand rough handling. Matched sets of altimeters are supplied to obtain maximum accuracy in utilizing the two-base method of precise altimetry.—*Wallace & Tiernan Products, Inc., 1 Main St., Belleville 9, N. J.*

HYDRAULIC JACK—Designed to meet the special needs of house movers, a 25-ton model and a 10-ton model hydraulic jack, feature a safe, wide base; minimum required clearance; high lift; easy, positive hydraulic action; self-return, and ability to operate in any position—horizontal as well as vertical. Each unit is tested to 40 percent overload.—*Curtis Jack Co., Inc., 1234 Roy St., Seattle 9, Wash.*

POWER SEWER CLEANER — Designed to speed sewer cleaning operations and increase work safety, a power bucket machine features a folding third wheel for easy positioning, a cast steel cable swivel permitting rotation under pulls up to 10,000 lbs. and a booster clutch to be used on loads over 1500 lbs. Included are Zerk lubrication system, overnight drum, H. D. semi-elliptic springs, solid steel axle, 6:00 x 16 tires and a large tool box. One man can lift the touring end.—*Flexible Sewer-Rod Co., 9059 Venice Blvd., Los Angeles 34, Calif.*

MASONRY WATERPROOFING — Brushed or sprayed onto a masonry surface, one application of Crystal waterproofing will eliminate the capillary action causing water to soak through a wall. Not a coating, Crystal penetrates the surface and does not stop "breathing" self-cleaning properties. Accelerated weather and aging tests show that Crystal does not deteriorate even 8 years after it has been applied. One gallon covers up to 200 sq. ft.—*Wurdack Chemical Co., 4987 Tyler Ave., St. Louis 9, Mo.*

(*Continued on p.* 104)

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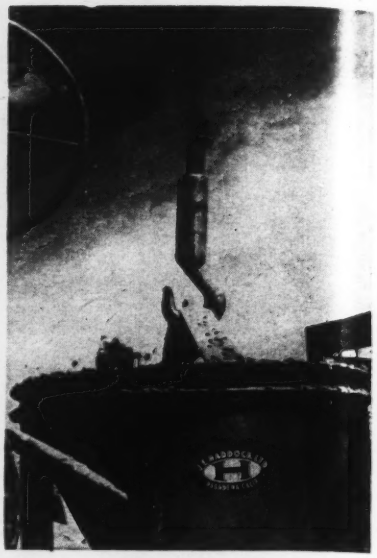
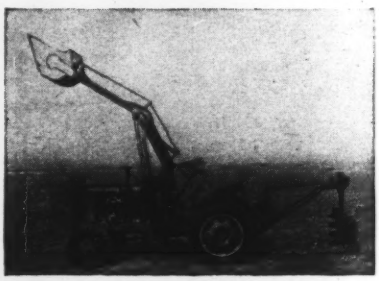


NON-TWIST SWIVEL FOR WIRE ROPE — Miller annular ball-bearing swivel prevents wire rope from twisting and unlaying. Because swivels enable loads to arrive at their distination in almost the same position as they leave point of origin, they have proved useful for hoisting steel sheets, beams, loading pipes, handling telephone poles, setting forms, and loading various types of oil field equipment. Weight of swivel is 32 lb., enough to return whip line to ground when using a long boom. Swivels are available in sizes for 1-, ¾- and ⅝-in. wire rope. They are cadmium-plated to prevent rust and deterioration. —*General Machine & Welding Works, 1100 E. Second St., Pomona, Calif.*

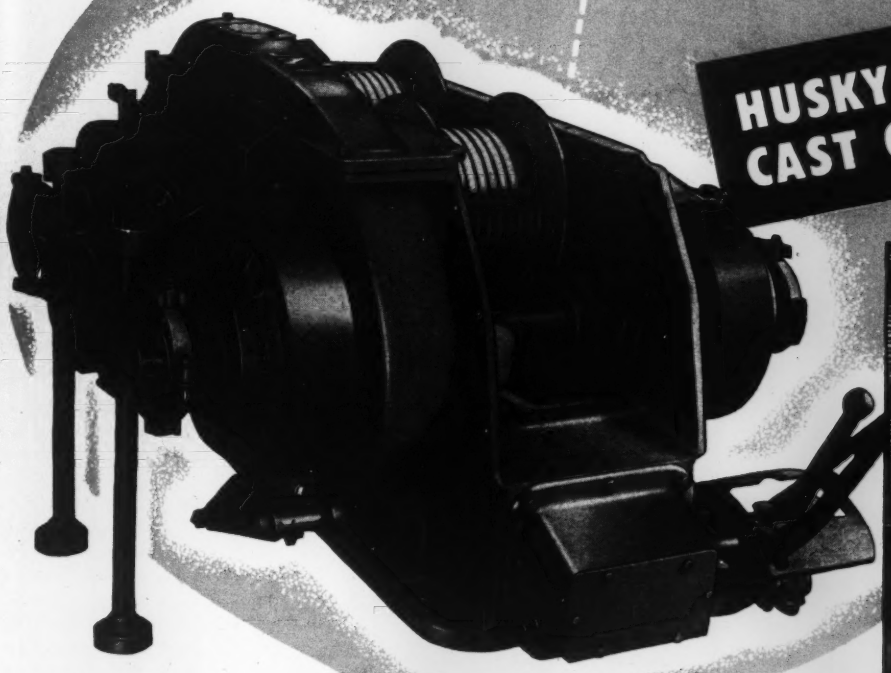


LOADER AND AUGER—Designed for mounting on Case DAI industrial tractor. Loader of ⅜-yd. struck capacity has dumping height of 8 ft. 6 in. Auger is designed for mounting on rear of tractor. Standard loader bucket is interchangeable with fork lift, angle dozer, coal bucket, wide bucket, and crane hook. — *Construction Products Corp., 4345 East Imperial Highway, Lynwood, Calif.*

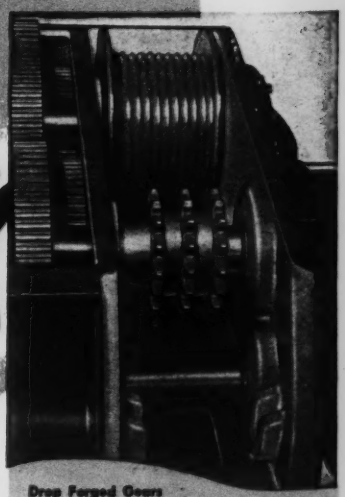
LOW COST POWER UNITS—Selling in the low price bracket, the "Cubline" power units open up broader fields for hydraulics application. Each of the 6,

(*Continued on p.* 106)

THE "HEART" of Every UNIT



HUSKY ONE-PIECE CAST GEAR CASE



Drop Forged Gears . . . Involute Splined Shafts . . . All alloy steel and heat treated! Involute splines provide greater strength and eliminate wear . . . No keys to replace . . . No worn-out keyways. Forging "heats" toughness into these gears. Shafts are accurately ground for perfect alignment, and gears are precision cut to close limits.

EXCLUSIVE WITH UNIT!

- All gears and shafts are completely enclosed in a constant flow of oil . . . positive protection for all moving parts . . . no chance for dust or dirt to cause abrasive wear.
- Bored for perfect alignment by a machine designed specifically for this accurate operation . . . misalignment is impossible.
- Self-lubricating . . . this case eliminates the need for frequent greasing or adjustment.
- All clutches are smooth operating, disc type, and completely interchangeable. Mounted on the higher speed countershafts instead of directly to drum shafts . . . a modern, approved engineering practice.

Easy to service from all sides . . . Fewer parts . . . Lower maintenance costs! Gasoline or Diesel engines are mounted "straight-in-line" with main machinery in every model . . . Crawler or "rubber-tired" mobile UNITS available.

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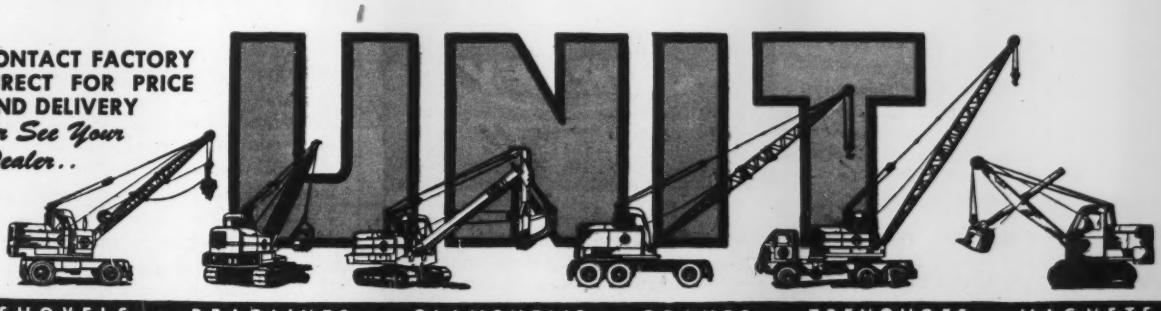

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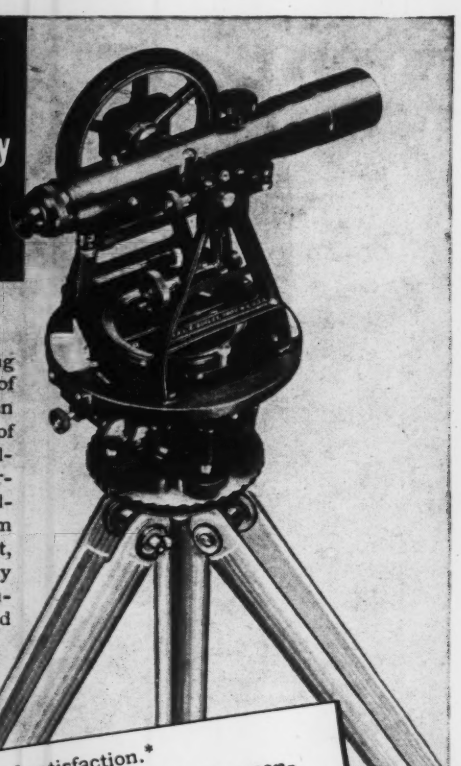
7 reasons why so many engineers say "Give me a Gurley"



An engineer knows from long experience that he is certain of his surveying instruments when he is certain of the maker...of its progressiveness, of its knowledge of his problems, of its year-in and year-out devotion to quality. That's why so many, from beginner to seasoned specialist, say, "Give me a Gurley". They know in specifying a Gurley instrument that they are assured of *all* these advantages:

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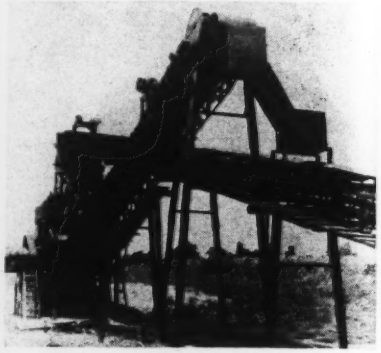
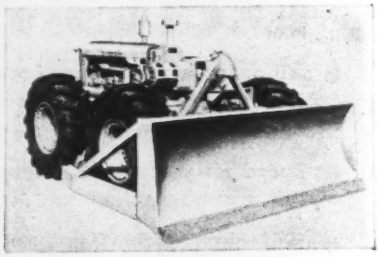
10. and 15 gpm. units consists of a 35 gallon round oil storage reservoir with foot mountings; electric motor; 1000 psi. gear pump, relief valve; coupling; pipe and fittings; suction hose and clamps.—*Hydraulic Press Mfg. Co., Hydro-Power Division, Mt. Gilead, Ohio.*



CONVEYOR—A standard conveyor 30 to 120 ft. long is furnished in 5 ft. increments. Belt widths are 18, 24, and 30 in. In selecting any conveyor the only information necessary is type and amount of material to be handled in a given time and distance and height to be moved. Rated capacity is handled at 300 ft. per min. and maximum slope of 18 deg. Conveyor belt, motor mounting, V-belt drive, and motor will be provided along with the standard items when specified.—*Pioneer Engineering Works Inc., Minneapolis* 13, *Minn.*



PUSHER AND BULLDOZER—High-speed machine for dozer and pusher loading is 300-hp. unit on 24x29 ground grip tires with a top speed of 13.6 mph. both forward and reverse. Tournadozer has four forward or reverse speeds made possible by constant-mesh principle in transmission design. Electrically operated blade control is feature of 25-ton tractor dozer. Source of electrical current is a 240-v., 120 cycle a.c. generator built in line with the diesel engine. Height blade can be raised above ground is 3 ft. 10 in. Approximate shipping weight is 50,700 lb. Overall dimensions are: width, (blade mounted) 13 ft. 10 in.; length, 19 ft. 7 in.; wheelbase, 7 ft. 6 in.; gage, 8 ft. 10½ in. Machine is recommended as a pusher unit with large scrapers.—*R. G. LeTourneau, Inc., Peoria, Ill.*

(*Continued on p.* 110)

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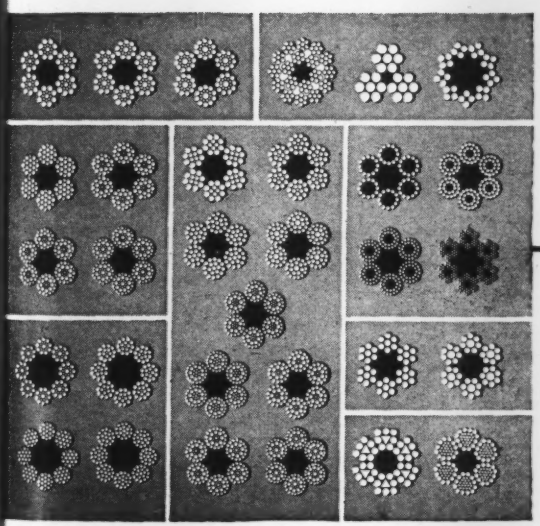

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Use fast-working electrical tools on any construction or maintenance job with this high capacity, portable, compact electric plant. Equipped with four-receptacle box for direct plug-in of tools or lights. Available with carrying frame, or dolly-mounted. Powered by Onan 10 HP, two-cylinder, 4-cycle, air-cooled engine. Shipped complete . . . ready to go!

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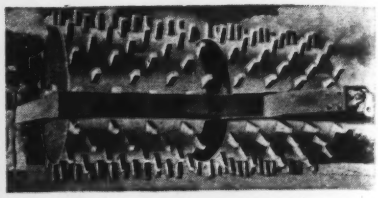
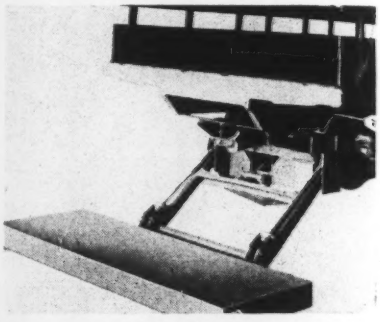
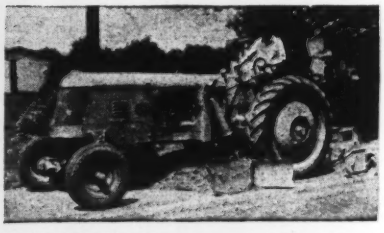


TAMPING ROLLER—New Gebhard Model 1TO is designed to give maximum compaction of earth for dams, airports and railroad fills. Equipment has special wedge-shaped feet, hardsurfaced for long life. Each foot has a bearing pressure of 590 lb. per sq. in. Roller comes in one- or two-drum units. Double unit is attached to a central draw shaft with heavy steel hinges. Each drum acts independently over terrain irregularities. — *Shovel Supply Co., Dallas, Texas.*



HYDRAULIC - LIFT TAILGATE—One man can lower or raise pay load to or from ground. Capacity is 1,500 lb. Device, power-operated, weighing only 733 lb. complete with all mounting parts, can be installed on any truck or semi-trailer body. Reduces need for loading docks and hazards involved in manual loading and unloading. Through convenient lever, operator has complete control of load on tailgate and can raise, lower, start or stop at any position between ground- and truck-bed level.— *Cemco Industries, Inc., Galion, Ohio.*



BERM LEVELER—Attachable to standard Huber maintainer for operation along hard-surfaced roads. Hydraulic controls operate blade of maintainer to angle and depth necessary to carry material to pavement edge. Apron, or gathering blade, is bolted to maintainer moldboard. This carries excess material picked up in cutting berm and deposits it in rough or low spots along

(*Continued on p.* 112)

fait accompli!

FROM "Dream" to "Delivery" is sometimes a long, rocky haul. And the road to Nowhere is paved with good ideas that haven't been delivered. So it's news that the American DIESELECTRIC Locomotive Crane is a *fait accompli* . . . a thing accomplished . . . a reality.

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See ad on page 113 for list of equipment in each line

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Mo., Kansas City, Machinery & Supplies Co., Inc.
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Blue Brute Electric
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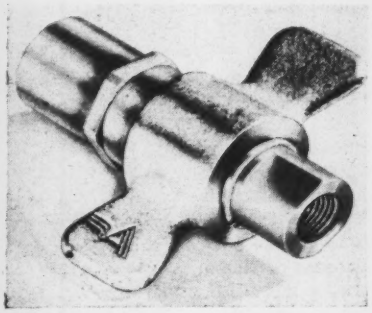
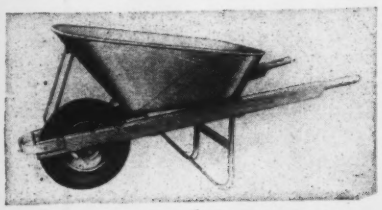
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts

road edge. Berm leveler, mounted on rear of maintainer, is adjusted by hydraulic control to desired pressure. Road cleaner blade is mounted on rear of leveler attachment to remove small stones and dirt left by berm blade.—*Huber Mfg. Co., Marion, Ohio.*

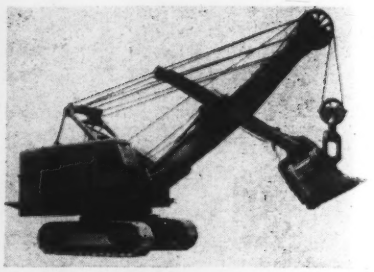


SELF-SEALING COUPLING—Hydraulic fluid lines may be connected or disconnected instantly without loss of fluid or inclusion of air with a self-sealing coupling. Flexible hose lines, suitable for low, medium, or high pressure application, are equipped with detachable reusable fittings for air, hydraulic fluids, gasoline, lubricating oils, fuel oils, and refrigerant gases at temperatures ranging from —65 to 300 deg. F.—*Aeroquip Corp., Jackson, Mich.*

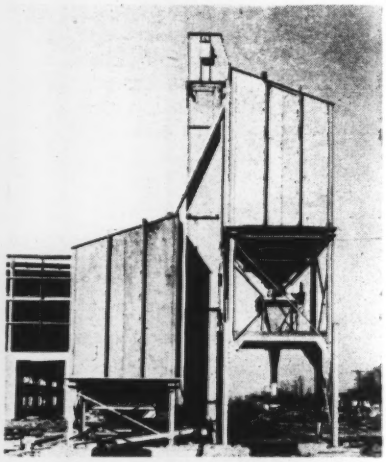


LIGHTWEIGHT WHEELBARROW—of 3½-cu.ft. capacity, body of sturdy wheelbarrow is made of heavy gage steel with corners overlapped and welded to provide a double thickness on all four corners. Equipped with 4:00 x 8 pneumatic tire for easy rolling. Wooden handles are bolted to tray. Extra heavy dump-bar extends in front of wheel.—*Vanco Products, Inc., 130 S. Weber St., Colorado Springs, Colo.*

TWO-WHEEL TRAILER COMPRESSOR—Air Chief Model 160 is 4-cylinder V-type compressor with capacity of 160 cfm. Perfect chassis balancing provides handling ease. New trailer compressor unit is 153 in. long, 72 in. wide and 66 in. high; it weighs 4,300 lb.—*Davey Compressor Co., Kent, Ohio.*



POWER SHOVEL—Quick convertibility extends the operating advantages of a 2½-yd. excavator to dragline, crane and clamshell work. Features are a two section independent, chain crowd, self-equalizing 37-in. retract clutch, 3-ft. 9-in. boom point sheaves, non-torsional shipper shaft, boom foot shock absorbers and a ratchet and pawl dipper trip. Diesel-powered, the 1005 model supports the 19½ ft. double dipper sticks at the deep midsection of a rigid 26-ft. box-section boom. With a 60-ft. boom, crane lifting capacity is listed at 101,000 lb. Crawler shoes can be replaced with 36 or 42-in. shoes, and 10 and 20-ft. boom extensions are provided.—*Koehring Co., 3026 W. Concordia Ave., Milwaukee 10, Wis.*



PORTABLE CEMENT PLANT—Improved portability and use of an auxiliary bin are features of a bulk cement batching plant. An undertrack screw feeder, 20 ft. 6 in. from hopper bottom to elevator, enables installation of a low-level auxiliary bin on the car-unloading side of the elevator. An overflow chute passes cement from the main or batching bin to the auxiliary bin, and the latter has a side gate for passing material to the screw feeder and thence by elevator to the main bin. The entire bin section is a one-piece weld-assembly. Auxiliary and main bins are of the same design and are furnished either in 200-bbl. or 400-bbl. sizes, giving total plant storage capacity of 200, 400, 600, or 800 bbl.—*Blaw-Knox Co., Pittsburgh, Pa.*

NO OTHER STANDARD PAVER COULD DO THIS JOB!

Here's a typical example of how Ransome Blue Brute versatility pays off when you're up against out-of-the-ordinary conditions. With the "live" boom-and-bucket you don't have to split batches. Instead, you discharge the complete batch into the bucket and run out the bucket to wherever needed. Then, with positive hydraulic control, you open the bucket doors *just enough to discharge the required amount!*

You can see how this patented Ransome feature eliminates costly accessories and extra labor — *and it's standard equipment only on Blue Brute Pavers!*

Many other advantages show why 34E Single or Dual Drum Pavers do *more* jobs — faster, better, for less cost. Your own jobs — paving or non-paving — will benefit by Ransome's famous mixing action, accurate water-measuring, all-weather batchmeter and foolproof, self-cleaning, fast-charging skip.

Get the whole story on Blue Brute Pavers from your nearby Worthington-Ransome Distributor (see page 112) or write for Bulletin 208. RS-6

WORTHINGTON PUMP AND MACHINERY CORPORATION
Worthington-Ransome Construction Equipment Division, Holyoke, Mass.
Distributors In All Principal Cities

HERE ARE THE FACTS

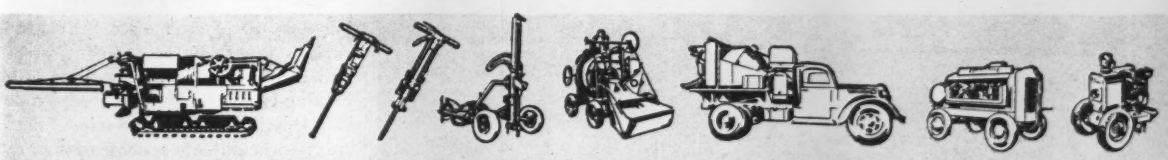
The Holland Construction Company's Ransome Blue Brute 34E Dual Drum Paver pouring concrete for the Country Club Bayou storm sewer in Houston, Texas. Because of the distance and depth involved, a special "elephant's trunk" funnel is used.

Only Blue Brute's exclusive, hydraulically operated "live" boom-and-bucket, plus its long reach, permit completely controlled pouring at any rate and any angle — a vital necessity on jobs like this, with hard-to-get-at forms!

Reports from similar types of jobs state that savings effected by this exclusive Ransome feature exceed $100 daily — by eliminating an extra 1½ yd. crane, crane operator and up to 4 additional men.

WORTHINGTON

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

for better design

Specify Macomber Units

for steel framing

FLOORS

Macomber V Bar Joists not only have the nailing feature WITHOUT wood strips but the open construction of the original bar joist. With the stronger, nailable top chord, panel points are farther apart providing greater room for pipe and duct installations.

WALLS

Macomber Load Bearing Partition Panels give you the structural advantages of steel, the nailing qualities of wood plus the OPEN advantages of V Studs. Here again is outstanding engineering without penalizing the man who installs pipe and conduit.

ROOFS

Macomber Roof Systems give the designer a wider selection of standard catalogued items for the job at hand. Regardless of existing conditions or new work, check Macomber Roof members. Available from one source are Trusses of all types; Purlins, Longspans and Decking. Write.

IN MEXICO D. F. — MACOMBER DE MEXICO — CEDRO 500

V-BAR JOISTS AND PURLINS • V-STUDS • TRUSSES • LONGSPANS • DECKING

MACOMBER

INCORPORATED

CANTON, OHIO

STANDARDIZED STEEL BUILDING PRODUCTS

Manufacturers' Publications

SANDERS—(8-p. pamphlet) Portable electric and portable air-driven sanders for use on wood, metal and composition. Also information on complete sanding kits with illustrations and prices of various accessories.—*Sterling Tool Products Co., 1340 No. Milwaukee Ave., Chicago 22, Ill.*

BUILDING WIRE—(48-p. booklet) Contains information on many types of electric wire and cable required by the building industry. Descriptions and specifications of various insulations used in Hazard building wires. Data for planning new wiring and re-wiring of electrical installations. Manual is designated as Bulletin H-408.—*Hazard Insulated Wire Works Division, Okonite Co., Wilkes Barre, Pa.*

WATERPROOF BAGS—(12-p. booklet) Describes jobs that can be done with waterproof laminated textile bags. Bags are made of one or more layers of creped kraft paper laminated to cotton or burlap cloth. Booklet illustrates variety of bag-closing methods.—*Bemis Bro. Bag Co., 408 Pine St., St. Louis 2, Mo.*

SELF-POWERED HAULING UNIT (6-p, folder) New heavy duty rig, called Tournahauler, is mounted on large rubber tires for load capacities ranging from 20 to 100 tons. Designed for off-road hauling needs.—*R. G. LeTourneau, Inc., Longview, Tex.*

MIDGET HYDRAULIC POWER UNIT—(4-p. folder) "Ten-ton Tony" has double acting cylinder and ram. Measures 6 x 7 x 9 in. overall. Requires 2½ hp. to operate at 1200 rpm. Weighs only 15 lb.—*Hydro-Power, Inc., Springfield, Ohio.*

HOISTING MACHINERY — (15-p. booklet) Illustrating and describing the various types of standard O.K. hoists, this booklet presents a complete selection of modern hoisting machinery.—*O. K. Clutch & Machinery Co., Columbia, Pa.*

CASEMENT WINDOWS — (12-p. booklet) Steel casements for homes of various types, steel basement windows and utility windows are described in a catalog issued by Detroit Steel Products Co. Detail drawings of various installations and complete specifications are included.—*Detroit Steel Products Co., 3159 Griffin St., Detroit 11, Mich.*

COMPLETE CORE DRILLING SERVICE

for foundation testing, prospecting and all types of exploratory work

World-wide service!

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Whether you wish to prove your property's value, prospect new fields or determine foundations, experienced Joy crews are prepared to make test borings for you . . . quickly and economically . . . any place in the world.

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22-HD CORE DRILL

Conservatively rated at 1750 ft. capacity with "E" rods, the 22-HD is built for drilling in all formations. Compact design and modern lightweight alloy construction assure its portability.

SUL-SET DIAMOND CORE BITS

The ridge design of these bits allows faster drilling speed and produces unusually accurate cores.

W&D C1304

SULLIVAN DIVISION

JOY MANUFACTURING CO.

GENERAL OFFICES: HENRY W. OLIVER BLDG., PITTSBURGH, PA.

Full Power Full Torque

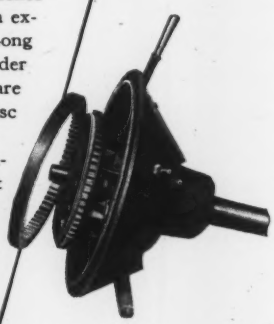
Lippman Engineering Works quadruple agricultural limestone pulverizing unit powered by a Model ME-66 Murphy diesel engine through a Twin Disc Power Take-off.

The ability of Twin Disc Power Take-offs to transmit the full horsepower and full torque of internal combustion engines throughout the life of the equipment is an important reason why so many leading engine manufacturers offer these units as standard equipment.

The actual torque capacity of the clutches used in Twin Disc Power Take-offs is far in excess of their rated horsepower capacity. Long service life and the ability to stand up under temporary overloads and normal slippage are outstanding characteristics of these Twin Disc units.

Twin Disc Power Take-offs consist of a complete clutch power take-off assembly with shaft and bearings mounted in a compact, rigid cast-iron housing. Clutches are either single (6.5″ to 24″) or two plate (11.5″ to 24″) of the gear-tooth type, with capacities up to 650 hp.

When ordering construction, material-handling or aggregate-plant equipment, specify a Twin Disc Power Take-off as a *must* with the engine selected. For complete information on Twin Disc Power Take-offs and Reduction Gears, write for Bulletin 129-B. TWIN DISC CLUTCH COMPANY, Racine, Wis., (Hydraulic Division, Rockford, Ill.)



Twin Disc Power Take-off.

Reduction Gear

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

Machine Tool Clutch

Marine Gear

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

ELECTRIC CABLE HOIST—(6-p. bulletin) Bob Cat line includes new 3 to 5-ton models featuring reduction in size by inclosing motor inside cable drum. Cutaway view shows details of double internal (epicyclic) gear train employed instead of straight gear train commonly used. Standard lift is 20 ft. Capacities range from 2,000 to 10,000 lb.—*Lisbon Hoist and Crane Co., Lisbon, Ohio.*

SUBMERSIBLE PUMP—(4-p. bulletin) Close-coupled pump and motor units for operation while completely submerged. Motor is oil-filled and sealed for underwater operation. Pumps may be any one of several different centrifugal or turbine types. Capacities range from 100 to 7,000 gpm. and motor sizes from 7½ to 350 hp. Can be installed in any position: vertical, horizontal or on an incline.—*Byron Jackson Co., Box 2017, Terminal Annex, Los Angeles 54, Calif.*

WALL FORM TIES—(8-p. pamphlet) Covers Twistyes, clamps, threaded tie rods, cone nut assemblies, wrenches and rod pullers. This publication supersedes previous price lists.—*Universal Form Clamp Co., 1238 No. Kostner Ave., Chicago 51, Ill.*

SURVEYING INSTRUMENTS—An informative 4-page brochure, combining a catalog and calculating chart, has been prepared covering this company's complete line of surveying instruments.—*C. L. Berger & Sons, Inc., Boston, Mass.*

CHEMICAL PRODUCTS—(16-p. booklet) Classifies Hercules Powder Co.'s chemicals by family groups including cellulose, synthetic resins, rosin, terpene solvents and chemicals, chlorinated products, dairy products, explosives and sporting powders. All of the products listed are briefly described as to chemical makeup, uses and potential applications.—*Hercules Powder Co., Wilmington, Del.*

HOSE FITTINGS—(6-p. pamphlet) Catalog pages cover couplings of several types, hose nipples and a variety of air and gas hose fittings. Featured are recommendations for attaching couplings to hose. There is also a table showing the various couplings recommended for different types of hose and a detailed discussion of coupling threads and their functions. Each fitting is pictured and described, with sizes available listed.—*B. F. Goodrich Co., Akron, Ohio.*

UNDERGROUND PIPE INSULATION—(4-p. folder) Describes "Z-Crete", a special mix of insulating concrete designed particularly for the

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insulation of underground heated piping. Product is composed of specially graded and compounded insulating aggregate, Portland cement and a liquid waterproofing admix. These materials are mixed and placed on the job and cast in place to form a solid covering of water-repellent insulation. Leaflet describes method of insulation.—*Universal Zonolite Insulation Co., 135 So. LaSalle St. Chicago 3, Ill.*

MOTOR SCRAPER—(12-p. booklet) Illustrates motor scraper in action and details of its construction. Also detailed specifications for TS-300 machine.—*LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa.*

LIGHTWEIGHT PUMPS — (4-p. folder) Describes characteristics, performance and uses of lightweight centrifugal self-priming pumps. Three sizes, include Midget 1½-in., the Hawk 2-in. and the Eagle 3-in. Bulletin 7LW-13 describes improved priming principle. Weights of pumps range from 62 to 117 lb. All models are constructed of cast aluminum for lightness and are equipped with carrying handles.—*Gorman-Rupp Co., Mansfield, Ohio.*

MANGANESE STEEL CHAIN — (28-p. bulletin) Factual data show advantages and ultimate economy of manganese steel chain for tough jobs involving shock and abrasion. Manganese steel sprocket wheels and elevator buckets also are treated in Bulletin 742-CN—*American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill.*

CRANE—The Wayne Crane Division of the American Steel Dredge Co. Inc. has issued a 20-page illustrated catalog No. 406 describing one-man operated rubber-tired machines that serve as a 5-ton crane, ½ yard clamshell, ½ yard dragline, ½ yard power shovel or ½ yard trench hoe.—*Wayne Crane Division, American Steel Dredge Co., Inc.*

AIRPORTS—(32-p. booklet) A new "Design Manual for Airport Pavements" (AP-10) prepared by the Wire Reinforcement Institute, Inc., contains the latest data on the use of welded wire fabric reinforcement in airport pavement design. The manual is an up-to-date handbook for the engineer in the design of airport landing facilities conforming to C.A.A. requirements for projects planned under the Federal-Aid Airport Act, for drainage systems, subbases, and reinforced concrete pavements for runways, taxiways and aprons.—*Wire Reinforcement Institute, Inc., 1049 National Press Building, Washington 4, D. C.*

RUD-O-MATIC TAGLINE

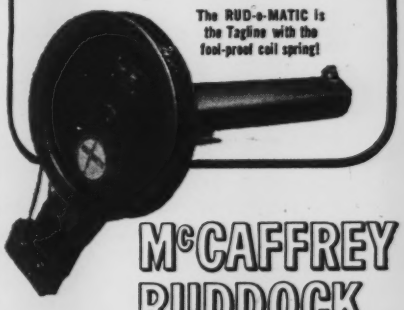
Provides positive, steady tension — holds buckets steady under all working conditions.

Spring tension holds buckets steady. No weights, pins, tracks, or carriages. Cable saving more than pays for RUD-o-MATIC. Compact—easily installed. Eight models to fit all bucket sizes.

RUD-o-MATIC Taglines are used as standard equipment by most crane manufacturers. Spring tension is powerful enough to hold a clam shell bucket steady. Operates with boom at any angle. Compact – it can be installed in less than thirty minutes. No pins, weights, tracks, or carriages to wear or be replaced. Taglines are complete with fairlead U bolt clamping plates, and cable attached. Immediate delivery – see your equipment dealer – or write –

- *Dealers—selected territories in Midwest and Northwest are still open. Write for all details.*

RUD-o-MATIC combination Magnet Reel and Tagline . . . operates on spring tension principle with tagline attached to magnet to steady – and electric cable fastened to magnet connections with all slack needed to prevent cable from being pulled or jerked loose from connections. Exclusive with RUD-o-MATIC.



McCAFFREY RUDDOCK *Tagline* Corporation

2131 East 25th St., Los Angeles 11, Calif.

CEMENT GUN COMPANY

"GUNITE" CONTRACTORS

GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

DAM REPAIRED WITH "GUNITE"

The two photographs show the Bulls Bridge Dam of the Connecticut Light and Power Company, which is one of many dams we have repaired for this Company.

The upper view shows the work in progress, and gives some idea of the condition of this structure before repairs were made. The lower view is of the completed job.

After chipping out the loose and disintegrated concrete and sandblasting the entire area, heavy reinforcing mesh was placed over the surface of the old concrete and "GUNITE" applied two inches thick, plus the material required for filling deeply eroded portions.

Our 72-page bulletin A2300 describes scores of similar "GUNITE" jobs.

Write today for bulletin A2300.

MANUFACTURERS OF THE "CEMENT GUN"

For over 43 years the Earle Gear and Machine Co. has been designing and building operating machinery for bridges, dams, locks, gates and dredges for hundreds of installations throughout this country and abroad.

Why not take advantage of this "know how"—get the benefit of experience.

Earle Gear engineers will gladly work with you to help solve your gear or machinery problems. Earle Gear equipment will assure you positive, trouble-free operation with a minimum of maintenance and repair.

Enlist the aid of our specialists by getting in touch with us, now—or, if you want further information first, write for our new catalog on Earle operating machinery.

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EARLE OPERATING MACHINERY EARLE GEARS

Manufacturers' Activities

Sales—Robert H. Taylor has been appointed territory salesman for Washington, northern Idaho, and Montana by the PENNSYLVANIA RUBBER CO. . . . Max Bradshaw has been appointed ALLIS-CHALLMERS district manager for Ohio, West Virginia and western Pennsylvania. . . . MARION POWER SHOVEL CO., Marion, Ohio, announces the appointment of John K. Dolan as district manager in charge of its Kansas City, Mo., office. . . . LINK-BELT CO. has announced the appointment of Crozier S. Wileman as district sales manager at Wilkes-Barre, Pa. . . . William W. Hickey now represents the FLEXIBLE STEEL LACING CO. in the New England and New York territory. . . . Kenneth F. Whitfield, formerly assistant general sales manager, has been promoted to advertising and sales promotion manager of WALKER-TURNER, DIVISION OF KEARNEY & TRECKER CORP., Plainfield, N. J. . . . The BUFFALO-SPRINGFIELD ROLLER CO. of Springfield, Ohio, announces the appointment of Ralph L. Wolf as central district sales manager. . . . George J. Fischer has been named manager of national accounts of the Industrial Products Sales Division of the B. F. GOODRICH CO. . . . Dan Ebberts has rejoined the MADSEN IRON WORKS of Huntington Park, Calif., as national sales manager for the Madsen road construction equipment. . . . THE UNIVERSAL CONCRETE PIPE CO. has promoted Thurman Manley from Nashville office manager to sales representative for middle Tennessee. . . . J. M. Haughey has been placed in the position of sales manager by the WASHINGTON IRON WORKS, Seattle, Wash. . . . PENNSYLVANIA REFINING CO., Cleveland, Ohio, announces the appointment of Frank H. Webber to its sales force. . . . Appointment of A. J. Belanger as bituminous equipment sales engineer for PIONEER ENGINEERING WORKS, Minneapolis, Minn., has been announced. . . . THE CHICAGO BRIDGE & IRON CO. has established sales offices in Salt Lake City, Utah, and J. Graham Daniels has assumed duties as its manager. . . . CHAIN BELT CO. announces the opening of a new district sales office at Richmond, Va. with Fred W. Taylor as district manager. . . . Louis W. Mason has been appointed assistant to the general manager of sales of the NATIONAL TUBE CO., subsidiary of UNITED STATES STEEL.

Distributors—The TENNESSEE HEATING SALES CO., Knoxville, has been

"the Handiest Tote Rig on the Job"

. . . that's what they said at Patterson field

. . . that's what they say all over, about Le Roi 105 Tractair

Tractair's usefulness is increased still more when you fill its tool box with Le Roi-Cleveland Air Tools . . .

Handy is the word for this combination 35-hp wheel tractor and 105 cfm air compressor. Thanks to interchangeable front-end equipment and its own air power, Tractair sweeps, mows, and loads — tows, plows, and pulls — drills, bores, and digs.

Tractair is Econotrol-equipped so that it supplies air economically and maintains high average working pressures. You get still more out of Tractair when you use Le Roi-Cleveland paving breakers, spades, backfill tampers, and hand-held drills. The efficiency of these tools is such that they use little air while doing a lot of work.

Your Le Roi distributor can show you what we mean when we say "Tractair and Le Roi-Cleveland Air Tools save you money." See him soon and write us for our latest catalog, too.

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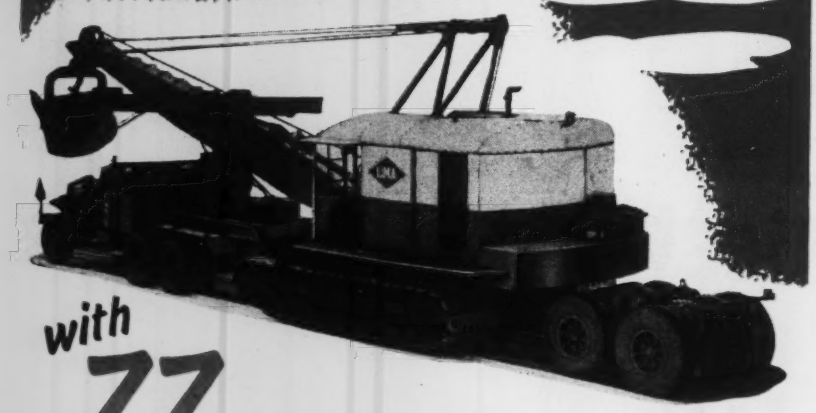
T-8

. . . Tractair and Le Roi-Cleveland Air Tools save you money

'DUCKING BRIDGES'

Photo Courtesy Weston Hauling, Inc., Glenshaw, Pa.



with 77 TONS OF SHOVEL ON A ROGERS GIRDER TYPE TRAILER

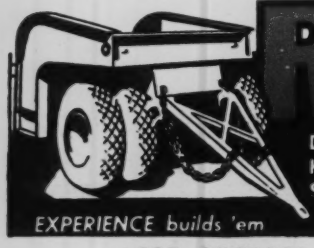
These heavy duty trailers are designed and built for the lowest possible road clearance.

Although not limited to such work they are used to a large degree in the transporting of crawler-mounted machinery of large size.

Rogers Girder Type Trailers have proven indispensable in areas where low bridges are prevalent or where other limited headroom clearances are encountered.

Illustrating 8-wheel rear assembly. Four-wheel assembly is also available.

Loading is accomplished by removing the rear wheel assembly. The machine moves into position over the girder. The frame is then jacked up and rear wheels attached. The load is in position ready to roll.



ROGERS BROS. CORP.

DESIGNERS and BUILDERS OF HEAVY DUTY TRAILERS SINCE 1915

EXPERIENCE builds 'em PERFORMANCE sells 'em

135 ORCHARD ST. ALBION, PENNA.

appointed distributor for Davo "Counterflo" Heaters in Tennessee, east of the Tennessee River; southeast Kentucky; southwest Virginia; and North Carolina west of Asheville. . . . Appointment of George Park Tractor Co., Macon, Ga., to a full line dealership is announced by the Davey Compressor Co. . . . United States Rubber Co. has named the Graybar Electric Co. exclusive distributor for Uskon conductive rubber panels used in radiant heating by electricity. . . . R. G. Dinham Co. of Minneapolis, Minn., has been named as distributor by Economy Pumps, Inc., Hamilton, Ohio. . . . The George Haiss Mfg. Co., Inc., New York City and Chicago, announces the appointment of H. D. Williams in Philadelphia as their exclusive representative in eastern Pennsylvania.

Personalities—Appointment of Allen L. Chaplin as project engineer at its Natrium, W. Va., plant has been announced by the Columbia Chemical Division of Pittsburgh Plate Glass Co. . . . Paul Queneau has been appointed metallurgical engineer of The International Nickel Co. of Canada, Ltd., and subsidiaries. . . . George C. Romeiser has joined the staff of the technical department of the National Lumber Manufacturers Association to specialize in the field of hardwood utilization and government lumber specifications. . . . Lawrence W. Early has been transferred to the Hercules Powder Co's Salt Lake City office to be succeeded in the Los Angeles office by Robert W. Crabtree. . . . A. B. Ordway has been appointed to the executive staff handling overall policies of the Henry J. Kaiser Industries. . . . General Brehon Somervell, president of Koppers Co., Inc., has announced the resignation of Allen W. Morton as vice-president and general manager of the company's piston ring division. . . . J. S. Ferguson, general superintendent of the Hamilton plant of Armco Steel Corp., has been appointed technical director of the Argentine Steel Division of the Armco International Corporation. . . . W. G. Kaiser, manager of the Portland Cement Association's Farm Bureau, has been appointed assistant director of promotion. . . . A. P. Heiner has been made assistant to the vice-president in charge of public relations for the Kaiser Co., Inc., Iron and Steel Division. . . . The American Steel & Wire Co. has announced the appointment of James McCulloch as superintendent of construction, and Frederick C. Keiser merchant products engineer. . . . James E. Morrison has joined Hugh G. Purcell Co., Seattle, Wash., northwestern sales agent for the United States Pipe & Foundry Co. . . . American Acoustics, Inc.,

1878 - 1948

99-H

That has Everything

★ ★ ★ **Culmination of 70 Years of Grader Manufacturing**

Austin-Western, builder of the world's first Road Grader, in 1878, is proud to present "The Power Grader That Has Everything." Everything, including exclusive All-Wheel Drive, All-Wheel Steer, Controlled Traction, and Precision Sideshift, PLUS High-Lift Blade, Extreme Blade Reach, and Completely Reversible Blade, and a full line of time- and money-saving attachments.

The "99-H" pays maximum dividends day in and day out, year in and year out. No other machine will do *so many* highway construction and maintenance jobs *so well.* Your nearby Austin-Western distributor will be glad to tell you the whole story.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.

Austin Western

FUNDADA 1859

"Structural steel by Ingalls . . . for a new automobile plant." Or it could be paper, or chemicals or foods, for Ingalls is teamed up with many widely divergent industries to fabricate steel for their new plants.

And for sound reasons: Ingalls steel always comes fabricated to exact specifications. Ingalls steel service is efficient, satisfactory. Our years of experience and advanced methods often save customers time, trouble, money.

Competent engineering and erecting facilities. Write, wire or telephone for quotations.

INGALLS

THE INGALLS IRON WORKS COMPANY

The Ingalls Shipbuilding Corporation, Birmingham Tank Company, The Steel Construction Company. EXECUTIVE OFFICE, BIRMINGHAM, ALA., New York Office, 1 E. 42nd St. Fabricating plants at Birmingham and North Birmingham, Ala., Verona, Pa., and Pascagoula, Miss.

has named George E. Koch as its new plant manager.

Miscellany—GENERAL ELECTRIC Co.'s welding equipment division has taken new residence at Fitchburg, Mass. . . . San Francisco has been chosen as the location for new western divisional branch offices of the CLIPPER MFG. CO., manufacturers of masonry saws. . . . The third Dealer Service Training School for 1948 will be held by the FOUR WHEEL DRIVE AUTO CO. this month in its Clintonville, Wis., plant. . . . A new wholesale distributing service parts depot will be constructed by the INTERNATIONAL HARVESTER Co. in St. Paul, Minn. . . . THE TREMCO MFG. Co. will put into operation a new asphalt emulsion plant at Cleveland, Ohio. . . . The LINDE AIR PRODUCTS CO., a unit of UNION CARBIDE & CARBON CORP., has announced plans to construct an oxygen distributing station and acetylene producing plant at Fargo, N. D. . . . The name of LANCASTER IRON WORKS, INC., has been changed to POSEY IRON WORKS, INC. through action of the board of directors.

Deceased—Recently deceased are W. L. Nicholson, 65, president and founder of the V. L. NICHOLSON CO., Knoxville and Nashville, Tenn, and Frederick C. Field, 72, who was retired former head of the ASPHALT INSTITUTE laboratory.

Men and Jobs

T. C. Edminster, Sr., a civil engineer in Houston, Tex., for 30 years, and his son, **T. C. Edminster, Jr.,** a Texas A. and M. College graduate with 3½ years service with the U. S. Army Engineers, have organized the Edminster Engineering Co. The firm will do work in the fields of water and sewer systems planning, land surveys and subdivisions.

Arthur MacGregor of Buffalo, N. Y., has been promoted from senior engineer to associate engineer in the New York State Department of Public Works. He is assigned to District 5 in Western New York.

J. C. Bisset, former director of public works, Dallas, Tex., has joined Ashley G. Classen & Associates, consulting engineers, El Paso.

George Herbert Fooks has been appointed resident maintenance engineer of the Maryland State Roads Commission in Caroline County. He succeeds the late Harry Waldorf. Mr. Fooks has

been with the commission for nearly 17 years, working principally in southern Maryland and on the Eastern Shore.

Leon B. Pelishek of Clintonville has been appointed city engineer of New London, Wis.

Francis Dodd McHugh and **Theodore T. McCrosky** have announced the establishment of the consulting firm of McHugh & McCrosky to render service to private and public agencies on community and regional development problems at 23 East 26th St., New York City. Mr. McHugh, an architectural graduate of Cornell and also of the Harvard Graduate School of City Planning, was city planning director of the New York City Planning Commission from 1941 to 1946 and, for three years prior to that, research director of the commission. For five years, 1927-32, he was with the architectural firm of York and Sawyer. Most recently, Mr. McHugh has been a consultant to the New York Regional Plan Association and also to the United Nations permanent-site committee. Mr. McCrosky, a graduate civil engineer from Yale, has also been in planning work for many years, leaving the post of executive director of the Greater Boston Development Committee only this year. In 1941 and 1942, he was executive director of the Chicago Plan Commission and, like Mr. McHugh, he was once (1938-40) director of planning for the New York City Planning Commission.

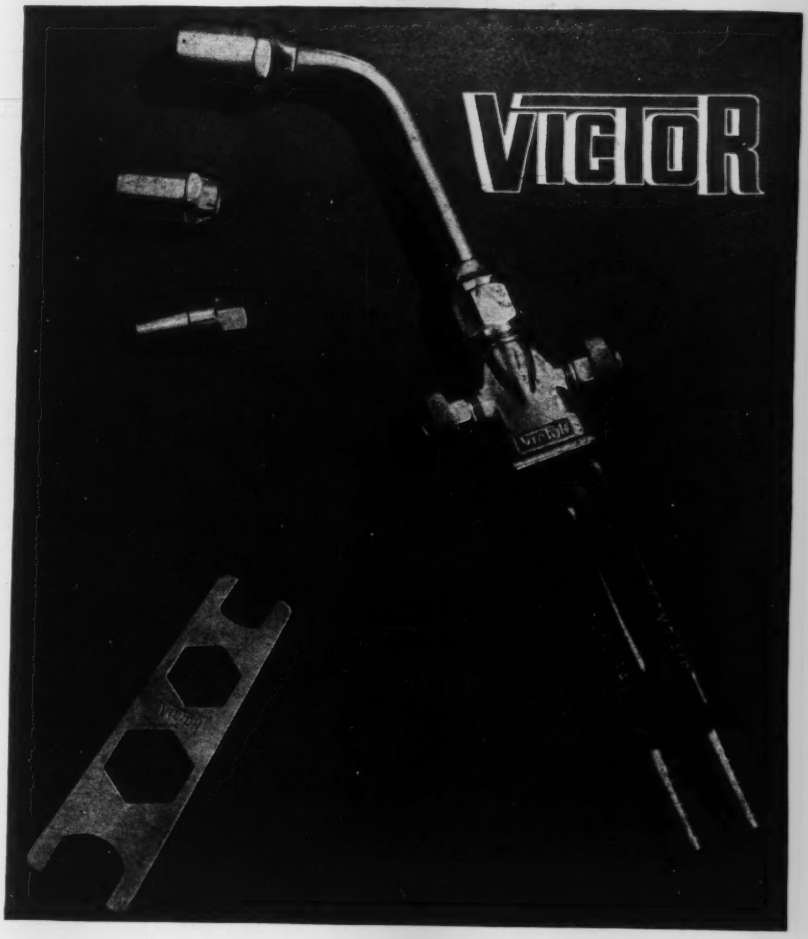
Jack Tallent of Knoxville, Tenn., and Spartanburg, S. C., has been appointed the first city manager of Camden, S. C. He is completing an administrative survey for St. Petersburg, Fla.

Harold V. Krotsch has been appointed acting chief building inspector for San Diego, County, Calif., to succeed Charles H. Salyers, who recently became chief of the State Division of Housing. Krotsch has been a building inspector for the last three years. During the war he was an architectural designer for the Navy Department.

Donald Wilfong, city building inspector at Hickory, N. C., has been named superintendent of public works for Hickory, succeeding G. B. Roberson, who resigned to go with the Elliott Building Co.

E. W. Garnett of Houston, Tex., has been named county road engineer of Brazoria County. He succeeds T. J. Dunbar, Jr.

J. Sid Pfaff, assistant city building inspector and secretary of the city zon-



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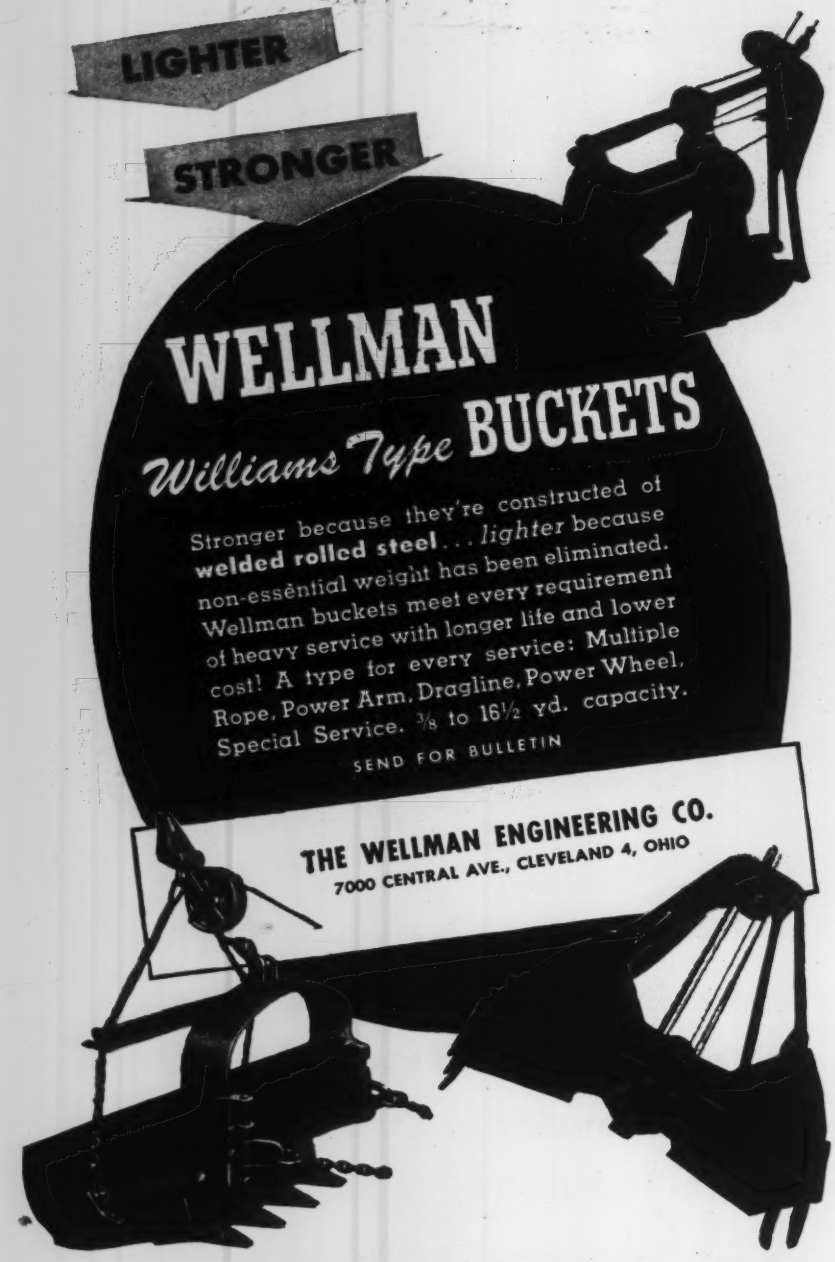

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ing board at Winston-Salem, N. C., has resigned. He has been connected with the city building inspector's office since January 1, 1936, and prior to that was with the city public works department. He also served as secretary of the zoning board of adjustment for several years.

J. T. Conroy, maintenance and construction superintendent of Dallas, Tex., since 1940, has been made director of public works for Dallas. He succeeds J. C. Bisset, resigned. Conroy has worked for the Dallas Public Works Department for 32 years.

Hal S. Crain of Durham, N. C., has been appointed a member of the North Carolina State Licensing Board for Contractors to succeed the late U. A. Underwood, also of Durham. N. K. Dickerson, Jr., of Monroe and V. B. Higgins of Greensboro have been reappointed to the board.

Harry Hugill, city engineer of Coos Bay, Ore., for the last six months, has resigned to enter private engineering.

H. A. Heinzerling of Haw Creek, N. C., has joined the Merchant Construction Co. at Asheville, N. C., as assistant engineer.

Paul E. Picket, of Raleigh, N. C., has been named assistant director in charge of engineering with the North Carolina State College Extension Division at Raleigh.

George Nicholson, of Long Beach, Calif., has been retained as consulting engineer in drafting a ten-year harbor improvement program for the San Diego Harbor Commission.

Frederick Bigger, of Pittsburgh, Pa., and William Wilson Wurster, of Cambridge, Mass., have been appointed to the National Capital Park and Planning Commission by President Truman. Mr. Bigger is chairman of the Pittsburgh City Planning Commission and Mr. Wurster is dean of the Massachusetts Institute of Technology school of architecture and planning.

Edwin C. Rogers has been appointed highway engineer for Madison County, Miss.

Claude H. Helms, city manager at New Bern, N. C., for the last year, has resigned to return to his former duties as city manager of Morganton, N. C., where he served for three years before going to New Bern. For 13 years prior to going to Morganton he was city manager of Tryon, N. C.

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1 Main St., Atwood. With population of about 1,500, Atwood scheduled 42,200 sq. yd. of concrete streets in '47.

2 Newly-built 5th St., Russell — part of 13,290 sq. yd. concrete street paving program undertaken during 1947.

3 Kansas Ave., Wichita, showing parking bays at right for park visitors. Wichita contracted for 264,512 sq. yd. of concrete street paving in 1947.

4 Broadway Ave., Great Bend, showing completion of concrete resurfacing project.

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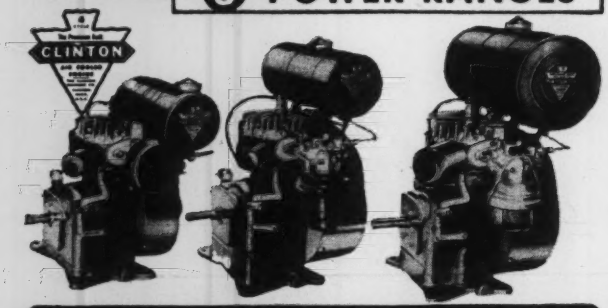

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Elections and Activities

Charles F. Bannan has been elected president of the California Metal Trades Association succeeding Joseph Moore, Jr., of the Moore Dry Dock Co. Also elected were Cloyd Gray, president of the W. R. Ames Co., San Francisco, as vice-president of the association, and Roy Tatam, general manager of Western Piping & Engineering Co., as treasurer.

The South Carolina State Board of Engineering Examiners has elected the following officers for the year beginning July 1: R. L. Sunwalt, of Columbia, chairman; F. R. Sweeny, of Anderson, vice-chairman; T. Keith Legare, of Columbia, secretary. The other members of the board are Harwood Beebe, of Spartanburg, and L. S. LeTellier, of Charleston. In order to expedite the handling of the large number of applications for registration being received by the board it was decided to have four meetings a year.

The District of Columbia Society of Professional Engineers has elected these officers. John J. Rockefeller, president; Melville L. Brown, vice-president; Alvin R. Olson, secretary-treasurer; Herman F. Lame, national director; and Herbert Manuccia, alternate national director. Joseph Powers was chosen a director of the D. C. society for three years.

Sam M. Wilson was elected president of the Cape Fear Engineers Club at a recent meeting at Fayetteville, N. C. Other officers are: L. C. Kerr, Sr., vice-president; and Paul G. Nyston, secretary-treasurer.

Cincinnati chapter, Ohio Society of Professional Engineers, has elected the following officers: Leonard Bauer, president; Ramon Colado, first vice-president; Lou Graf, second vice-president; Alfred LeFaber, secretary; and Harry Long, treasurer.

Officers for 1948-49 for the Fort Worth Branch, Texas Section of American Society of Civil Engineers, elected as follows: President, J. R. Hendrick, designing engineer, city Water Department; vice-president, John J. Burgess, with Carter & Burgess, Consulting engineers; secretary-treasurer, C. V. Thornton, executive with Steel Engineering Co., Fort Worth and Corpus Christi.

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New Engineering Books

(*Continued from page 96*)

MATHEMATICS OUR GREAT HERITAGE—By William L. Schaaf. 291 pp. Harper & Brothers, N. Y. $3.50.

MOLYBDENUM—Steels, Irons, and Alloys—By R. S. Archer, J. Z. Briggs, and C. M. Loeb, Jr. 391 pp. Climax Molybdenum Co., 500 Fifth Avenue, New York 18.

FUNDAMENTALS OF ELECTRICAL ENGINEERING—First Edition—By V. P. Hessler and John J. Carey. 241 pp. McGraw-Hill Book Co., New York 18, and London. $3.50.

DE BEREKENING VAN PADDESTOELVLOEREN—By A. M. Haas. 206 pp. Published by Eduard Ijdo, Leiden, Holland. (An abstract in English of this book on the computation of flat-slab floors is given in the back).

MALARIA CONTROL ON IMPOUNDED WATER——United States Public Health Service and Health and Safety Dept., Tennessee Valley Authority. 422 pp. For sale by the Superintendent of Documents, Washington 25, D. C.

Reports and Pamphlets

SYMPOSIUM ON LOAD TESTS OF BEARING CAPACITY OF SOILS—Special Technical Publication No. 79—American Society for Testing Materials, Philadelphia 3, Pa. $3.

EXTENDING APPLICATION OF THE FINENESS MODULUS—By Stanton Walker and Fred F. Bartel. Reprint from *Journal* of American Concrete Institute. National Sand and Gravel Association, 1325 E. Street, N. W., Washington 4, D. C.

SPILLWAY AND LOCK APPROACH CURRENTS, DEMOPOLIS LOCK AND DAM, TOMBIGBEE RIVER, ALABAMA. Model Investigation. Technical Memorandum No. 2-252. Waterways Experiment Station, Vicksburg, Miss. $1.

SOME PROPERTIES OF PAPER-OVERLAID VENEER AND PLYWOOD—Technical Paper No. 9—Housing and Home Finance Agency, Washington 25, D. C.

THE FACTS ABOUT HIGHWAYS—Citizens' Committee for Long Range Highway Planning, State Highway Dept., Frankfort, Kentucky.

THE HUMANISTIC-SOCIAL STEM OF ENGINEERING EDUCATION—An annotated Bibliography—Engineering Series No. 29. The Cooper Union Library, Cooper Square, New York 3, N. Y.

HOUSING STATISTICS HANDBOOK—Housing and Home Finance Agency. For sale by the Superintendent of Documents, Washington 25, D. C. $1.

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